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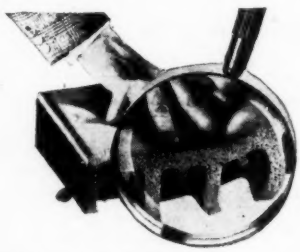

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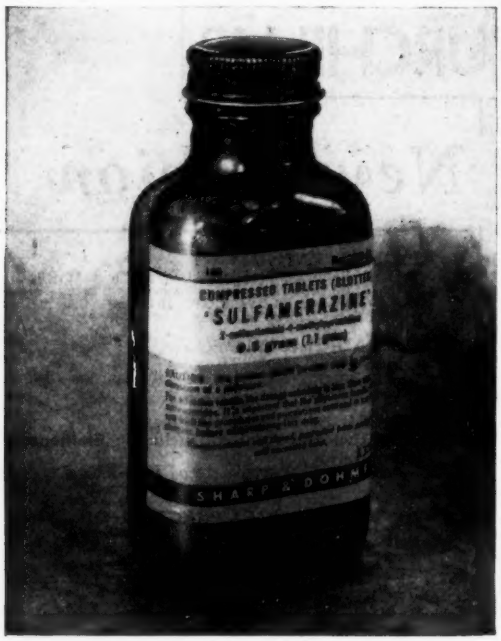

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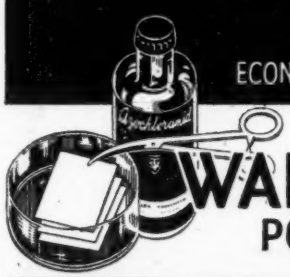

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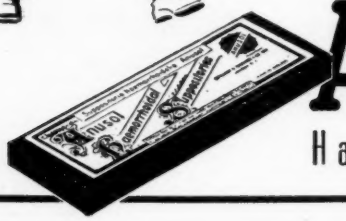

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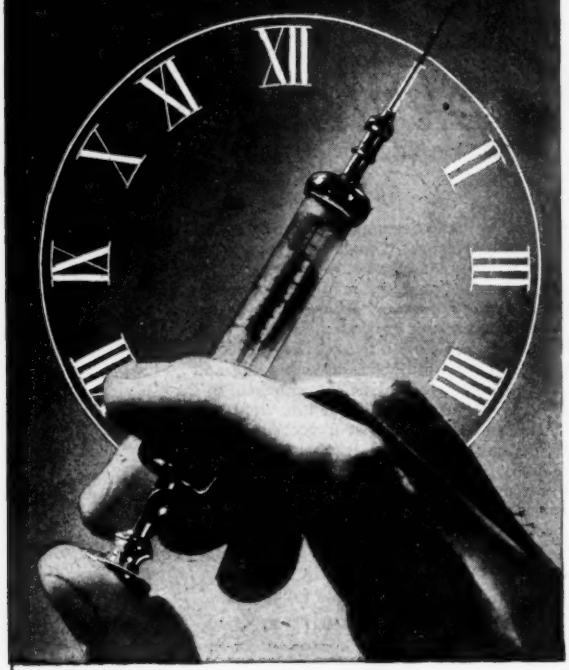

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RENAL SYNDROME
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D. S. PARSONS
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CAPTAIN RAMC

From the Liverpool School of Tropical Medicine

THE purpose of this paper is to discuss the nature and distribution of a type of renal failure seen in a great variety of acute illness, to emphasise that a diminished renal circulation is probably a constant factor in its production, and to consider whether "renal anoxia" may not be an appropriate name for it.

FEATURES OF THE SYNDROME

The syndrome is a condition of impaired renal function (with or without oliguria and anuria) developing usually in an acute illness, and often associated with a transient peripheral circulatory failure. The onset of oliguria or anuria is commonly the first sign. In patients who survive there is also a postanuric period of impaired renal function, with nitrogen retention and often a copious unconcentrated urine. The postanuric period may last for several weeks, but eventually there is complete and permanent recovery. The reversible nature of the renal failure is the chief feature that distinguishes this syndrome from the other forms of nephritis.

In patients who die the kidneys have a characteristic appearance post mortem. They are usually enlarged, with a swollen pale cortex and often an engorged medulla; the epithelium of the convoluted tubules is degenerate, necrosed, or desquamated. The damage may be concentrated chiefly in the ascending loop of Henle and the distal convoluted tubules, but in many reports the site of the tubular damage is not specified. The lumina of the tubules are usually filled with debris, and with desquamated cells either intact or in fragments. The debris is often stained deeply by the pigments which may be present in the urine at the time the lesions develop. The appearance of these deeply stained casts has frequently given rise to the statement that the tubules are blocked by the precipitation of pigment (Barratt and Yorke 1909). It is a constant observation that the glomeruli and their capsules appear nearly, if not quite, normal. The vessels of the medulla, on the other hand, are usually engorged, and often there are apparent hæmorrhages into the lumina of the tubules. There have also been many reports of interstitial œdema and cellular infiltration. The damage to the tubular epithelium, the engorged medullary vessels, the local hæmorrhages, and the relatively normal appearance of the glomeruli are the most frequent microscopic findings in the kidney.

It will be apparent that the syndrome is not a new one. Certain of its features have been described by Fishberg (1939) under the title of "larval" or "necrotising" nephrosis, in which the microscopic renal changes are well marked. He records examples of similar renal failure with less pronounced renal changes, under the term "prerenal azotæmia." Many of these, we feel, should also be included in the syndrome we are discussing. They frequently show the characteristic symptom-complex of oliguria or anuria followed by nitrogen retention and inability to concentrate the urine, and they may also show degeneration of the renal tubules (Fishberg, p. 60). Moreover the conditions in which prerenal azotæmia occurs (Fishberg, pp. 55–57) include many of the conditions listed below in which this syndrome has been accurately described. It is possible therefore that many cases of prerenal azotæmia are early or incomplete examples of the necrotising nephrosis described by Fishberg and that the underlying pathological process is the same. Maegraith (1944) has briefly described the syndrome and called it the "tubulovascular renal syndrome." So far as we are aware, however, no other attempt has been made to group together all its many manifestations and ascribe an ætiological factor common to them all.

OCCURRENCE OF THE SYNDROME

The main features have been noted in widely differing conditions, and we shall here mention only a few salient papers selected from a vast literature.

The anuria seen in *blackwater fever*, *incompatible blood-transfusion*, and the *crush syndrome* has been extensively studied. Barratt and Yorke (1909) and Baker and Dodds (1925) suggested that the cause is mechanical blocking of the renal tubule by precipitated pigment, but it has now become difficult to hold this view in its original form. Foy and his colleagues (1943) have reviewed the question and it is discussed again by them (1944) in connexion with *sulphonamide hæmolysis*, and also by Maegraith (1944) and Maegraith and Havard (1944).

On studying these cases of anuria in detail they are found to have the clinical, biochemical, and pathological features of the syndrome. In *blackwater fever*, Maegraith and Findlay (1944) describe the vascular collapse preceding the anuria, and Georgopoulos (1933) and Maegraith (1944) the nitrogen retention and the copious secretion of unconcentrated urine persisting for some weeks after recovery; the characteristic tubular and vascular lesions of the kidney in fatal cases are also recorded. Witts (1929) in a full report of a case of anuria following an *incompatible blood-transfusion* quotes Pemberton (1919) as noting peripheral circulatory collapse in this condition: "later the pulse may become very rapid or thready; the skin becomes cold and clammy." In Witts's case the anuria was followed by a high blood-urea and there was unconcentrated urine in the postanuric period. The patient died and his kidneys showed the characteristic picture of degenerated tubular epithelium, pigmented casts, hæmorrhages in the medulla round engorged vasa recta and relatively unchanged glomeruli. Ayer and Gould (1942) reported "necrosis of the distal convoluted tubules and collecting ducts" in 7 fatalities from blood-transfusion. They think a similar condition occurs in *icterus neonatorum*, which may be considered a biological example of an incompatible transfusion (Mollison 1942).

In blackwater fever, incompatible blood-transfusion, and icterus neonatorum there is extensive intravascular hæmolysis, but in recent years the syndrome has been frequently observed in *crush syndrome*, in which hæmolysis is lacking. Several writers have reported the dilute urine and persistent nitrogen retention during the postanuric period (Husfeldt and Bjering 1937, Longland and Murray 1941, Henderson 1941). The diminution of the urea clearance and its gradual restoration to normal in 14 weeks has been followed by Maitland (1941) in a patient who recovered from crush anuria, his case being a good example of the prolonged but eventually complete recovery of kidney function in patients who survive. The microscopic appearance of the kidney is similar to that found in incompatible blood-transfusion (Mayon-White and Solandt 1941, Bywaters and Beall 1941, Bywaters and Dible 1942). In the case described by Mayon-White and Solandt the patient did not have a blood-transfusion; so any question of incompatibility can be excluded. Dunn, Gillespie, and Niven (1941) concluded from a detailed study of two cases of crush syndrome that "the most definite changes are restricted to the ascending limbs of Henle's loop and second convoluted tubules," and this has been confirmed by Bywaters and Dible (1942).

In the conditions so far considered the syndrome is always associated with the presence of pigment in the urine, and it has been thought that the pigment, if not the immediate cause of the anuria, is at any rate the cause of the damage to the renal tubules. However, experiments designed to establish this have been inconclusive. The literature with regard to hæmoglobinuria was reviewed in 1942 by Yuile. It is clear that in some circumstances large amounts of hæmoglobin may pass through the kidney without inflicting serious damage; yet at times hæmoglobin does appear to damage the kidney, and the same seems to be true of myohæmoglobin. Bywaters and Stead (1944) have shown that myohæmoglobin from dogs can produce

renal damage in shocked rabbits, leading to anuria and death in some animals.

Probably everyone would agree that the presence of large amounts of pigment is likely to enhance the injury done to an already damaged kidney. But the syndrome develops in many conditions in which abnormal pigment is absent from the urine. In the *alkalosis* of *gastric tetany* that may arise during the treatment of peptic ulcers similar nitrogen retention occurs accompanied by similar characteristic changes in the kidney.

This condition has been known for over twenty years. Nitrogen retention and a diminished power of urea concentration were noted among the earliest cases reported (Ellis 1924). McCance and Widdowson (1937) described a full investigation of a patient who recovered completely, whose blood-urea was 100 mg. per 100 c.cm. and whose urea clearance was 7% of its normal value. Brown et al. (1923) and Cooke (1933) found calcification of the convoluted tubules, and Brown et al. comment upon the "shock-like symptoms" that accompany the condition. The literature is reviewed by Nicol (1940). McLetchie (1943) in another case found that the renal changes were like those found in the crush syndrome, except that the casts present were not pigmented.

Thus the impaired function and the microscopic appearance of the kidney in alkalosis or gastric tetany can resemble that observed in blackwater fever, incompatible blood-transfusion, and the crush syndrome, although in gastric tetany no foreign pigment is present in the urine. It is possible that an early stage in this condition was observed by the Army Malaria Research Unit (1945) during an investigation into the effect of large doses of alkali on normal subjects.

The glomerular filtration-rate, as measured by the inulin clearance, was at first greatly increased although the total blood-flow through the kidney, as measured by the diodone clearance, remained unchanged. At a later stage the glomerular filtrate returned to normal but the urea clearance was greatly reduced (to 25% of normal) while the diodone clearance was still not greatly altered. The blood-urea was raised to 60 mg. per 100 c.cm. and did not return to normal until a fortnight later. It is suggested that these effects may have been due to a redistribution of blood-flow within the kidney and to transient damage to the tubular epithelium.

There are also many other conditions in which the features of this syndrome have been reported. The anuria, the impairment of renal function, and the characteristic microscopic appearance of the kidney have been described in three cases of *septic abortion* (Bratton 1941); and he records six other similar cases in which the urinary suppression was not complete. Young (1942) gives a particularly clear account of five cases of the syndrome arising after *concealed accidental hæmorrhage* in which Dible, who examined the sections in three cases, comments that the appearances were similar or identical with those observed by him in crush syndrome. Pigment was present in some cases, absent in others. Young thinks that the syndrome is "by no means a rare sequel of difficult obstetrics." A condition in some respects similar has been noted in *cholera* (Rogers 1921, Chatterjee 1941), and Tomb (1942) gives reasons for his belief that the anuria of this disease and of crush syndrome has the same cause, which he suggests is renal anoxia. The urinary and renal changes observed in *yellow fever* and *Weil's disease* suggest that this syndrome is sometimes present (Boyce 1911, Stokes et al. 1917, Hoffman 1924, Georgopoulos 1933, Beeuwkes 1936, Findlay 1941, Harris 1942). The renal failure described in *diabetes* by McCance and Lawrence (1935) also suggests its presence, and they think that similar renal failure takes place in many other acute conditions. The same picture has been observed in the *hepatorenal syndrome*. Schutz et al. (1932) describe the kidney lesions in patients dying in "anuria and azotæmia" after crush injuries to the liver or operations on the gall-bladder. They state that "tubular epithelial degeneration progressing to actual necrosis was almost constantly observed. Patchy focal hæmorrhages and areas of leucocytic infiltration were the rule, while the glomerular changes were not noteworthy." Boyce and McFetridge (1935) collected some more cases of the same condition and review the relevant literature.

This brief review is sufficient to indicate that this syndrome develops in a large series of conditions. The evidence in some instances is not conclusive, but its cumulative weight is considerable. Anyone with patience to explore the literature must conclude that abnormal pigments in the blood and urine at most enhance or modify a syndrome which is very wide in its incidence, and the essential features of which can occur apart from the presence of either hæmoglobin or myohæmoglobin in the circulating plasma.

In the conditions so far considered, however, it may be supposed that the patients all had some toxic substance circulating in the blood-stream—if not abnormal pigments, then toxins derived from bacteria or the destruction of liver or other tissues. The observers reporting these cases usually consider that toxins of unknown nature are the cause of the damage to the kidney. But the frequent association of all these conditions with collapse of the peripheral circulation should also be noted.

The development of the syndrome in eight patients with *war injuries*—apparently uncomplicated by either musele ischæmia, crushing, or intravascular hæmolysis, has lately been described by Darmady et al. (1944). They recognise the similarity of the syndrome to that seen in blackwater fever, crush syndrome, and elsewhere, and they agree with Maegraith and Findlay (1944) that these conditions may be due to renal anoxia arising either from "hypotension or vascular spasm or both." This condition of *traumatic uræmia* has been independently observed in two other cases by Parsons (1945) All the patients were given blood-transfusions, but there was only one reaction, and neither intravascular hæmolysis nor pigmented casts were evident in these cases. The observations are important in demonstrating that this syndrome may develop in uncomplicated surgical shock—a possibility noted also by Moon (1944). They therefore direct our attention once again to the fact that all the conditions yet mentioned as giving rise to the syndrome are often associated with evidence of peripheral circulatory failure.

An apparent exception is *pernicious anæmia* in which some features of the syndrome have been reported.

Christian (1916) noted an impairment of the concentrating power of the kidney in this disease, varying with the severity of the condition. This has been confirmed by Fouts and Helmer (1938) using modern methods of estimating renal function. Stieglitz (1924) states that "the most common and uniform finding (in kidneys in pernicious anæmia) was tubular degeneration, often fatty in character, which occurred in 53% of all cases." There was also hæmosiderosis; iron was retained in both the proximal and distal convoluted tubules and in Henle's loop. Fishberg (1939, p. 352) comments as follows:

> "In pernicious anæmia . . . there may be marked impairment of concentrating power. The defective renal function in this disease is probably due to the poor nutrition of the kidney cells by the anæmic blood. It is known that the oxygen consumption of the kidney is very high. A considerable proportion of the oxygen is probably utilised in tubular reabsorption, which may thus be impaired by the deficient oxygen supply in severe anæmia and result in defective concentrating ability. On the other hand Stieglitz believed that their function may be impaired by the siderosis which is constantly present. That this is not the main cause is indicated by the fact that the concentrating power of the kidney is quickly affected by changes in the hæmoglobin content of the blood. According to Essen and Porges (1922) impairment of renal function is not yet present when the hæmoglobin has dropped to 50% but is very evident at 30%. In several patients I saw restoration of concentrating power when the anæmia disappeared as a result of liver diet. Fouts and Helmer (1938) found that the induction of a remission by liver treatment is accompanied by a rise in urea clearance."

We have therefore in pernicious anæmia evidence of minor degrees of this syndrome that appear to depend mainly on the degree of renal anoxia. A similar situation has occasionally been reported in *carbon monoxide* poisoning (Herzog 1920, Drinker 1938).

A similar renal syndrome has been produced in animals. Scarff and Keele (1943) have produced a general tubular lesion in rabbits by temporary constriction of the renal artery. The pathological picture they publish is closer in appearance to that often seen in the human syndrome than the leader on traumatic anuria in *The Lancet*

(1945) would suggest. Moreover Scarff and Keele observed nitrogen retention lasting 10–15 days before death or gradual recovery. These time relations resemble those accompanying the syndrome in man. The experiments indicate that renal anoxia produces a generalised injury to the tubule cells, which is the essential cause of the impairment of renal concentrating power. The precise site of the chief injury will probably be influenced by the secretory activity of the kidney at the time the anoxia occurs (cf. Dunn and Polson 1926, McFarlane 1941), and may well be affected by abnormal circulating pigments or other "toxins." In any case, as Paramore (1945) points out, the renal failure is the most important feature; the question whether the first or second convoluted tubule suffers most is secondary.

MODE OF PRODUCTION OF THE SYNDROME

Three different causes have been suggested:

1. *Mechanical blockage* (Barratt and Yorke 1909, Baker and Dodds 1925). This does not account for the many similar cases of anuria in which pigment is absent, and it has now been generally abandoned.
2. *A "nephrotoxic" effect* of some injurious substance carried to the kidney by the blood-stream (Bywaters and Dible 1942, Eggleton 1944).
3. *Renal anoxia*, the main cause of renal damage being the temporary deprivation of oxygen (Tomb 1942, Moon 1944, Maegraith and Findlay 1944, Darmady et al. 1944).

In weighing the last two hypotheses we must remember the wide distribution of the syndrome: we must seek some factor that is common to all the many conditions in which it occurs.

For some years search has been made, without complete success, for a circulating toxic substance that would reproduce the lesions. Attempts have been made to incriminate hæmoglobin in blackwater fever and incompatible blood-transfusion; but, as we have seen, the results have not been conclusive (Yuile 1942). It is remarkable indeed how difficult it is to obtain evidence of the toxicity of hæmoglobin by itself; and in any case it would not account for the syndrome in the many conditions unaccompanied by intravascular hæmolysis. An investigation into the possible toxicity of myohæmoglobin was also not entirely conclusive (Bywaters and Stead 1944). In the most favourable experiments, on rabbits damaged by a standardised compression of muscles and secreting an acid urine (which with rabbits is itself an abnormality), the injection of myohæmoglobin solution obtained from another species—the dog—was followed by severe renal failure; but in only 4 out of 25 cases. Myohæmoglobin had no effect on normal rabbits, and the utmost that can be deduced from these results is that in the rabbit the presence of foreign myohæmoglobin may modify or enhance the development of the syndrome. The primary cause of its development in man must be sought elsewhere.

Eggleton and others (1943) in dogs, and Eggleton (1944) in cats, found that muscle ischæmia was a necessary factor for the experimental production of the crush syndrome. The return of circulation to the ischæmic limb was followed by a sudden fall of blood-pressure, which could however be restored by the injection of gum-saline. Eggleton (1944) thinks that an unknown toxin from the ischæmic muscle is responsible for the impaired renal function. It was clear however that the animals used in these experiments were also in a state of severe circulatory collapse, which had to be treated before the experiment could be continued.

A toxin of entirely different origin must be looked for in cholera, yellow fever, Weil's disease, and septic abortion. In concealed accidental hæmorrhage a toxin must be sought from the placenta or possibly the uterus (Bratton 1941). In the hepatorenal syndrome it is necessary to posit another unknown toxin substance, this time liberated from damaged liver cells (Schutz et al. 1932). Stieglitz (1924) thought that renal damage in pernicious anæmia was due to the "toxic" action of the iron deposited in the tubules, although this, as we have seen, does not account for the immediate improvement in renal function on treatment with liver. In alkalosis and in diabetes the "toxin" appears in the form of a disturbed acid-base balance accentuated by dehydration.

Thus the nephrotoxic theory demands that a wide variety of toxins, many of them hypothetical or at least unidentified, shall all produce syndromes which are very similar in their clinical and pathological appearances. The situation is not unlike that existing in the study of rickets before the discovery of vitamins. Much labour has been expended in the search for the presence of some toxic substance, whereas the one factor common to these naturally occurring examples of the syndrome may be a temporary shortage of oxygen, whose presence in adequate amounts is as vital as any vitamin. Peripheral circulatory collapse is frequently observed in all the conditions in which the syndrome develops. The same observation is made by Fishberg (1939, p. 58) in connexion with prerenal azotæmia which, as we have seen, probably often has the same pathology as this syndrome. Corcoran and Page (1943) have shown (in dogs) that during the hypotension produced by bleeding, the renal blood-flow is probably distributed irregularly through the renal vascular bed. Cournand et al. (1943) and Lauson et al. (1944) have shown that the renal blood-flow in the circulatory collapse accompanying various forms of injury is very greatly reduced—more than can be accounted for by a fall in blood-pressure or in the general circulation-rate—so that they believe there is increased vascular resistance within the kidney. In these circumstances, therefore, the renal anoxia may become extreme, especially locally (Corcoran and Page 1943). Lauson et al. (1944) add: "This investigation confirms the hypothesis that urinary findings in shock, i.e., oliguria or anuria and loss or impairment of concentrating power, are the result of decreased circulation through the kidney." This point is emphasised also by Richards (1944). In the case of the intravascular hæmolyses the renal anoxia induced by circulatory failure would be further accentuated by the anæmia resulting from the hæmolysis, when the circulating hæmoglobin may fall to 20% of the normal or even lower.

We consider therefore that the evidence at present available favours the hypothesis that renal anoxia plays a large part in producing this syndrome, in that it results in damage to the renal epithelium, and consequent impairment of renal concentrating power. The oliguria and anuria that occur in many instances are probably the direct result of the disturbances of renal blood-flow that follow peripheral circulatory failure. If this is correct, it has an important practical application; for the prevention of anuria in these conditions will then depend more upon the support given to the circulation than, e.g., upon efforts to keep the urine alkaline. Blood-transfusion is the most effective means of providing the depleted blood-stream with fresh oxygen-carrying power in conditions where "shock" is accompanied by anæmia, as in traumatic hæmorrhage and in blackwater fever. To be effective, however, it must be given early; for, in rabbits at least (Scarff and Keele 1943), periods of anoxia lasting only an hour or so may produce renal damage which will require several weeks for recovery. The objection that relatively few cases of shock develop anuria (*Lancet*, 1945) can also be brought against the nephrotoxic theory. Only some 10–15% of cases of blackwater fever develop anuria, although all pass hæmoglobin through the kidney (Stephens 1937). Only a proportion of patients passing pigment in the urine after an incompatible transfusion or crush injury go into anuria. The supporters of the nephrotoxic theory should not therefore be surprised if only the more extreme degrees of vascular collapse lead, per se, to the production of this syndrome. The effect of minor degrees of collapse will be enhanced when the kidney tubules are working to their limit, as in alkalosis and gastric tetany in which the blood is reduced in volume and concentrated (Brown et al. 1923, McCance and Widdowson 1937, Nicol 1940). It is not unlikely that abnormal circulating pigments play a similar part in enhancing the effects of a temporary shortage of oxygen. The point is that the syndrome can arise in the absence of pigment, but so far as we know has not yet been seen in the absence of some degree of circulatory failure.

THE NAME OF THE SYNDROME

There is an urgent need for a name. The syndrome occurs in widely separate fields of medicine. It has been observed by surgeons, physicians, obstetricians, and

workers in tropical medicine. The reason why the facts known about it are seldom considered together is partly that no name for it has ever been generally accepted, and the labour of tracing all the papers in which it is described is often prohibitive. The absence of a generally accepted name is thus holding back investigation. Apparently the condition was known to Osler and his contemporaries as "acute parenchymatous nephritis" (Moon 1944). The "larval or necrotising" nephroses described by Fishberg include "all those due to degenerative lesions of the renal parenchyma." These are wider in character and incidence than the syndrome we are considering, for they include many undoubtedly toxic conditions such as metallic poisoning. Moreover nephrosis is a term best avoided where possible. "Prerenal azotæmia" (Fishberg 1939) is misleading; for the uræmia is, as he suggests himself, due in many cases to renal failure. The "tubulovascular renal syndrome" (Maegraith 1944) is an accurate but perhaps overlong description. None of these terms gives any clue to the ætiology.

The evidence from Darmady et al. (1944), in conjunction with that from Lauson et al. (1944), justifies "renal anoxia" as a convenient and brief term for the renal syndrome that occurs in acute peripheral circulatory failure. Whether it may also legitimately be applied to the other examples of the syndrome described in this paper is a question that we hope may stimulate further research into the renal circulation and function in these conditions. Our opinion is that it will be found accurate enough term for most of them, and that it may meanwhile be adopted as a convenient, if somewhat challenging label, recognising that its accuracy though probable is not yet proven.

It will be clear that renal anoxia indicates only one common factor in a long and varied chain of causation. The question remains, what are the causes of the anoxia? If the answer be peripheral vascular failure, the question then arises, what is the cause of the peripheral vascular failure? Here is room for any number of "toxic" substances, but we are also touching the problem of the causation of "shock"—which is another story.

SUMMARY

A form of renal failure is described, which occurs in a wide variety of clinical conditions.

In a brief review of the published work evidence is presented which indicates that the syndrome is probably caused by renal anoxia, usually secondary to peripheral vascular failure.

It is suggested that "renal anoxia" is a suitable name for the syndrome.

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TRANSFUSION AND THE ANÆMIC HEART

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BLOOD-TRANSFUSION may be an essential life-saving procedure in severe anæmia. The main purpose of such transfusions is to raise the oxygen-carrying power of the arterial blood by increasing the concentration of hæmoglobin, and, although the exact time is difficult to assess, clinical evidence suggests that it is often a matter of days before improvement becomes evident. Meantime there is a period of risk and anxiety, for it is well known that patients with severe anæmia stand transfusion badly. Many of these so-called "transfusion reactions" appear to be circulatory in origin, since the clinical signs, and in fatal cases the post-mortem findings, show pulmonary œdema (Fishberg 1937, Drummond 1943).

There is good evidence that the heart is not normal in severe anæmia; anginal symptoms indicate myocardial ischæmia (Pickering and Wayne 1933); radiographic heart size and post-mortem heart weight may be increased and electrocardiographic changes present (Cabot 1926, Ellis and Faulkener 1939, Sharpey-Schafer 1944). This paper reports the effects of transfusion on circulatory dynamics which have been studied by cardiac catheterisation, a method allowing serial measurement of the output of the heart and the pressure in the right auricle.

METHODS

Blood-volume was measured by a concentrated-corpuscle hæmoglobin method (Hill 1941, McMichael et al. 1943). About 500 c.cm. of concentrated corpuscles (110–140% Hb) were transfused at moderate rates. Patients were propped up in bed with the trunk elevated 45°. Cardiac output and right auricular pressure were measured by cardiac catheterisation (McMichael and Sharpey-Schafer 1944a). Right auricular pressure reflects changes in venous filling pressure under the present conditions of study. In normal supine subjects, right auricular pressure is about 4 cm. below the sternal angle.

CIRCULATORY ADJUSTMENTS IN SEVERE ANÆMIA

It has been shown previously (Sharpey-Schafer 1944) that a number of circulatory adjustments are found in cases of severe anæmia (figs. 1 to 4):

1. *The clinical signs* suggest a rapid circulation and arteriolar vasodilatation. The heart-rate is moderately increased. The pulse-pressure is increased and the pulse water-hammer in type. The skin is pale but warm, and capillary pulsation can be seen in the extremities and elsewhere. Observation of the neck veins may show a conspicuous rise of peripheral venous pressure.
2. *Blood-volume* is decreased, often to levels as low as 2 litres (McMichael et al. 1943).

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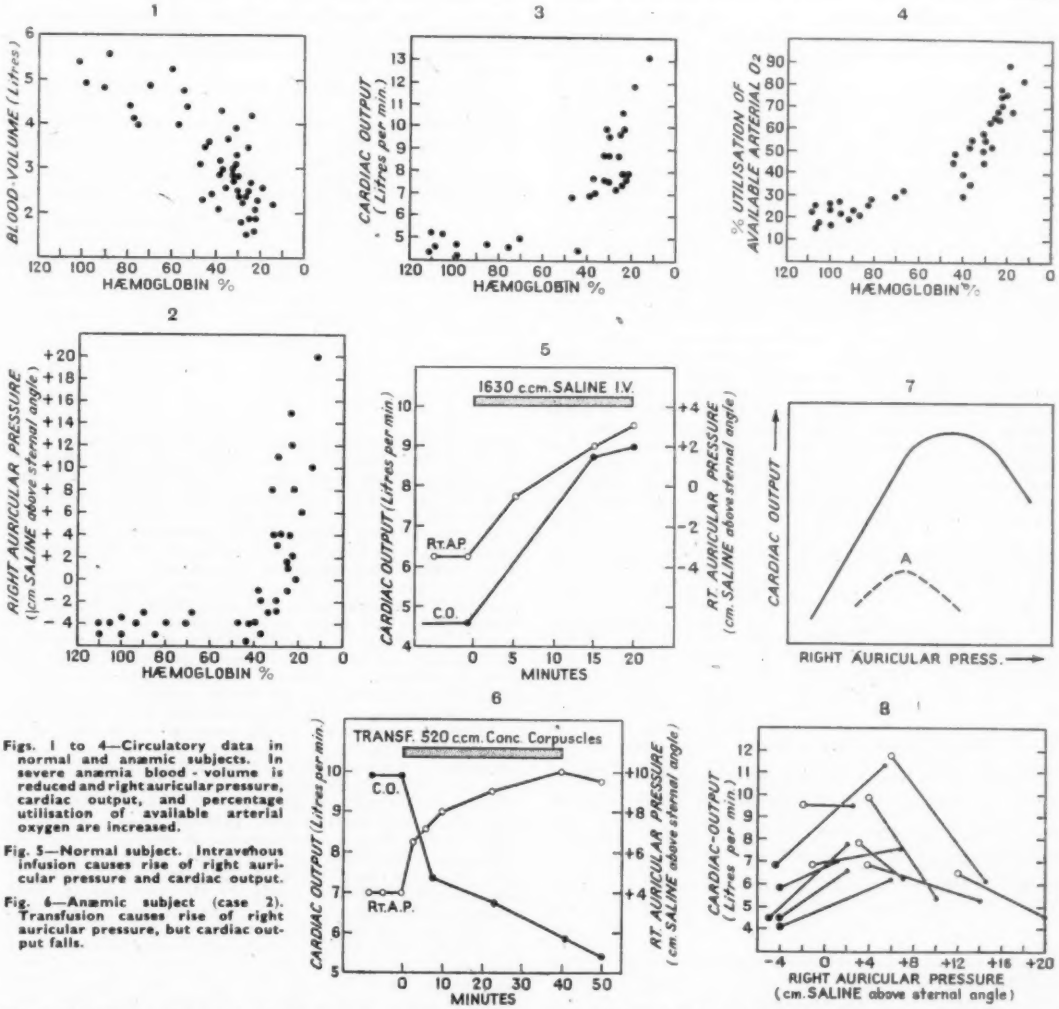

Figs. 1 to 4—Circulatory data in normal and anæmic subjects. In severe anæmia blood-volume is reduced and right auricular pressure, cardiac output, and percentage utilisation of available arterial oxygen are increased.

Fig. 5—Normal subject. Intravenous infusion causes rise of right auricular pressure and cardiac output.

Fig. 6—Anæmic subject (case 2). Transfusion causes rise of right auricular pressure, but cardiac output falls.

Fig. 7—Thick line represents Starling's curve for a normal heart. Cardiac output increases with a rise in right auricular pressure until a point is reached when further rise in pressure results in a falling output. "A" represents suggested position of cases of severe anæmia and dotted line their "Starling's curve" if thick line were curve for a normal human heart.

Fig. 8—Effects of raising right auricular pressure by transfusion for comparison with Starling's curve. Circles represent initial data and lines the effect of transfusion on right auricular pressure and cardiac output. Normal subjects (black circles) show increasing output, and anæmic subjects (white circles) show falling output.

3. *Right auricular pressure* is increased.
4. *Cardiac output* is increased.
5. *Percentage utilisation of available arterial oxygen* is increased.

The finding of increased cardiac output in the presence of a diminished blood-volume is somewhat contrary to current views on the part played by the blood-volume in the maintenance of the circulation. It is possible that increased output may result from a faster heart-rate and a high right auricular pressure, and that the latter results from as yet unstudied mechanisms such as increased venous tone.

A transfusion increases the blood-volume and raises the venous filling pressure. Risks of overloading are likely, therefore, since a transfusion given to a severely anæmic patient with a low initial blood-volume will result in a proportionately greater increase of blood-volume which will tend to raise further the already high right auricular pressure.

EFFECTS OF TRANSFUSION

Normal subjects.—Any intravenous infusion which increases the blood-volume acutely causes a rise of right auricular pressure. This in turn causes an increase in cardiac output (McMichael and Sharpey-Schafer 1944a), as expected from Starling's law of the heart. An example is shown in fig. 5.

Anæmic patients may show an entirely different cardiac output response to a rise of right auricular pressure from transfusion. In 5 of 7 patients the cardiac output decreased instead of increasing as in the normal. The 2 patients who did not show a falling cardiac output had the lowest initial right auricular pressures. Results are shown in table I and an example of the type of observation in fig. 6. At first glance it might be supposed that improvement is indicated when cardiac output falls from an initial high level, for hæmoglobin concentration has been increased by the transfusion. Unfortunately this is not the case, for, as already stated, increasing right auricular pressure must result in increased cardiac output, if the heart is normal. Further, clinical evidence does not suggest improvement: case 3, a severely ill woman with widespread carcinomatosis, developed pulmonary œdema and died six hours later; autopsy showed pulmonary œdema (heart weight 400 g.,

coronary arteries normal). Case 1 also developed early signs of pulmonary œdema following transfusion, but, after some anxious hours, recovered.

Another case (case 8, not shown in table I), an œdematous woman of 63 with severe hypochromic anæmia, showed Hb 23%, blood-volume 2·7 litres, right auricular pressure +17 cm. above the sternal angle, and cardiac output 9·9 litres per min. She was given 540 c.cm. of concentrated corpuscles at 18 c.cm. per min. Cardiac output was not measured at the end of transfusion, but it probably fell. Five hours later the patient was thought to be clinically improved, but at 10 hours pulmonary œdema developed rapidly and death followed. Autopsy showed pulmonary œdema as the cause of death (heart weight 380 g.).

Many other examples could be quoted of pulmonary œdema following transfusion in these desperate cases, but enough has been said to indicate that a falling cardiac output does not represent improvement.

Blood-pressure changes.—Four cases showed a rise of blood-pressure after transfusion (table II). This is a remarkable finding in view of the falling cardiac output. Mean blood-pressure varies as cardiac output × total peripheral resistance, so that rising blood-pressure and falling output indicates considerable increase in total peripheral resistance, which may be due to arteriolar vasoconstriction rather than viscosity changes. Further evidence on this phenomenon will be presented elsewhere; in the meantime a rising blood-pressure after transfusion

TABLE I—FINDINGS IN SEVEN ANÆMIC PATIENTS TRANSFUSED

			Before transfusion					Transfusion	After transfusion		
Case	Sex	Age	Hæmoglobin (%)	Blood volume (litres)	R. auricular pressure cm. saline sternal angle zero	Heart rate	Cardiac output (litres/min.)	Amount transfused c.cm.	Rate of transfusion (c.cm./min.)	R. auricular pressure cm. saline sternal angle zero	Heart rate	Cardiac output (litres/min.)
1	F	57	19·2	2·6	+ 6	110	11·8	530	13	+ 14·5	120	6·1
2	F	57	31	3·1	+ 4	106	9·9	520	21	+ 10	104	5·4
3	F	77	22·5	2·1	+ 12	74	6·5	510	29	+ 20	84	4·6
4	F	45	23	1·6	+ 3	96	7·9	475	47	+ 7		6·3
5	F	76	27·3	2·4	+ 4	92	6·9	480	37	+ 14	92	5·3
6	M	43	25	3·5	− 2	96	9·5	475	34	+ 2·5	96	9·5
7	M	50	38	3·2	− 1	106	6·9	505	13	+ 7	104	7·6

cannot be regarded as evidence of improvement in cases of severe anæmia.

DISCUSSION

It is suggested that the heart in severe anæmia behaves like Starling's overloaded heart-lung preparation. Starling (1918) showed that, if the rate was kept constant, raising the venous filling pressure caused a parallel rise in cardiac output until a point was reached where a further rise in pressure caused no further rise in cardiac output, and at still higher venous pressures a fall in cardiac output resulted (fig. 7). In severe anæmia the heart seems to respond as in this last phase, so that when the venous filling pressure is further raised by transfusion, the result is a falling cardiac output. Fig. 8 shows the relation between right auricular pressure and cardiac output in normal and anæmic subjects for comparison with Starling's curve. Cases 6 and 7 probably represent an intermediate response along the top of the curve. Figures are not available for Starling's curves for normal human hearts, but it is known that cardiac output can reach high figures (25 litres per min. or more). It seems possible that in severe anæmia the curve is set at a much lower level, although resting cardiac output may be more than twice that of a normal subject. Indeed the initial high output in anæmia may represent the maximum output on the right auricular pressure: cardiac output curve, and the high right auricular pressure may indicate an adjustment which serves to maintain optimum output. This plateau seems precarious, for not only does overloading result in falling output and pulmonary œdema, but we have evidence that lowering right auricular pressure (by bleeding or digitalis, McMichael and Sharpey-Schafer 1944b) may also result in a falling output. The dotted curve in fig. 7 indicates the suggested position of these anæmic hearts.

The practical applications of these findings are as follows:

Amount and rate.—Intravenous infusions of 2000 c.cm. at rates up to 160 c.cm. per min. have no deleterious

TABLE II—FINDINGS IN FOUR CASES WHERE BLOOD-PRESSURE ROSE, WITH A FALLING CARDIAC OUTPUT, AFTER TRANSFUSION

Case	Before transfusion		After transfusion	
	Cardiac output (l. per min.)	Blood-pressure (mm. Hg)	Cardiac output (l. per min.)	Blood-pressure (mm. Hg)
1	11·8	100/50	6·1	125/65
2	9·9	114/55	5·4	122/65
3	6·5	135/70	4·6	170/80
8	9·8	116/50	..	134/64

effect on the normal human heart (Sharpey-Schafer and Wallace 1942), but the present results show that 500 c.cm. at more moderate rates may overload the anæmic heart. The usual practice of small transfusions of concentrated corpuscles is clearly correct, but it is well to remember that even the proverbial pint may prove too much. The reason for slow transfusion appears to be the slowness of venous filling pressure adjustments after blood-volume changes. Return of venous filling pressure towards the resting level may take place by changes in venous tone, but there is no evidence as yet on the magnitude or rate of such changes in severe anæmia. The position of drip transfusion is therefore uncertain, though pulmonary œdema is not unknown, and similar risks of overloading are probably present.

Venous pressure.—In severe anæmia it is undesirable to increase the venous filling pressure while long-term benefit from increased arterial oxygen content is the objective. Assessment of venous filling pressure, therefore, is of some importance when transfusions are given. Clinical observation of the neck veins (Lewis 1937) will give such information and prevent many disasters. This simple clinical measurement is probably quite as useful as manometric measurement in an antecubital vein, if direct observation of right auricular pressure is not possible. Clinical study of the pressure in neck veins usually requires elevation of the patient's trunk. The propped-up position, however, is probably the best for nursing and transfusing severely anæmic patients, for there is evidence that in this posture the right auricular pressure is lower than in the supine position. Clinical signs may not always prove adequate, and the most difficult cases require full investigation if treatment is to be rational, as the following case illustrates.

A woman, aged 60, with chronic gastro-intestinal bleeding was admitted with 21% hæmoglobin; a series of transfusions amounting to 2500 c.cm. were given. On the fourth day hæmoglobin was 67%, but blood-pressure was 80/45 mm. Hg, and she was thought to be bleeding and to require further transfusion. Cardiac catheterisation showed that right auricular pressure was increased to + 4 cm. above the sternal angle and cardiac output to 10 litres per min. Clearly only serious risks of falling output and pulmonary œdema could be expected from further transfusion, which was therefore contra-indicated.

Since raising the venous filling pressure is deleterious in severe anæmia, it would be rational to use drugs which lower venous pressure. Digitalis has this action (McMichael and Sharpey-Schafer 1944b) and intravenous digoxin might be tried during or after transfusion. At present we have no evidence to offer on the use of digitalis beyond the successful transfusion of a patient with 12% hæmoglobin, right auricular pressure +20 cm., cardiac output 13·1 litres per min., who was also given 1·5 mg. digoxin intravenously.

SUMMARY

In severe anæmia the blood-volume is reduced and the right auricular pressure, cardiac output, and percentage utilisation of available arterial oxygen are increased.

Transfusion raises the right auricular pressure and in normal subjects increases cardiac output, but in severe anæmia cardiac output may fall. Acute pulmonary œdema follows in some cases and the blood-pressure may rise.

It is suggested that this falling cardiac output is similar to Starling's overloaded heart-lung preparation, where increased venous filling pressure results in falling cardiac output.

The purpose of transfusion in severe anæmia is long-term benefit from increased arterial oxygen content, while venous filling pressure is raised as little as possible. Hence the small slow concentrated transfusion. Other suggestions include the use of the propped-up "cardiac" posture, and clinical observation of venous pressure.

I am indebted to Dr. Violet Breakey and Dr. John McMichael for their help in making the observations, and to the staff of the Radiological Department and Mr. A. H. Latham for technical assistance. The Medical Research Council defrayed some of the expenses.

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LOCAL SPREAD OF DRUGS IN THE ORAL CAVITY

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THE efficacy of drugs administered by mouth as pastilles, lozenges, or pills for local therapy in the treatment of tonsillitis or pharyngitis depends largely on the direction of salivary flow. This salivary flow appears to vary in individuals and with the posture adopted. Arnett (1943), using chewing-gum containing gentian violet or methylene blue, showed that there was little or no staining of the tonsils or pharynx when the patient was in an upright position, but some staining if the patient was recumbent. Vollum and Wilson (1945), using pills containing methylene blue, found that in 16 out of 22 volunteers there was either very slight staining or no staining at all of the tonsils, and in only 2 was there a slight streak of dye on the pharynx. They also found that in 6 patients with enlarged tonsils placed in a semirecumbent position there was good tonsillar staining in 1 case, while the remaining 5 showed a little staining only. The pharynx was not reached at all. From this they concluded that drugs given in the form of lozenges or chewing-gum could have little or no effect on the throats of persons in the upright or sitting position, unless the chewing-gum or lozenges were sucked almost continuously, since only a fraction of the dye was deposited on the tonsils and none on the posterior pharyngeal wall.

METHOD

Having been working for some time on the use of penicillin pastilles in oral inflammation (MacGregor and Long 1944, 1945a and b) we considered it important to repeat these experiments ourselves in order to estimate the amount of penicillin likely to reach affected areas at the back of the mouth. For this purpose we obtained the coöperation of 50 volunteers, of whom some had had tonsillectomy, and in the rest all degrees of tonsillar size were found. The pastilles used were of the same base, shape, and size as those we have used containing penicillin, but they contained 1% of methylene blue in place of the usual 500 units of penicillin. The base used was stiff gelatin, and the size approximately 1 cm. square by 4 mm. thick. The usual technique for penicillin pastilles was applied—i.e., the pastille was placed in the mouth in the buccal fold between the cheek and the teeth and allowed to dissolve without agitation. The mouths were examined 5 min. after insertion of the pastille and again at 15 min. The time required to observe the mouths at these intervals necessitated dividing the volunteers into four groups of twelve, these groups being examined on separate days. Three independent observers assessed the staining in the mouth, and this was effected so that no observer knew what either of the other two had noted. The mouth was divided into four areas: the anterior pillar of the fauces; the uvula; the tonsil or, where this was no longer present, the tonsillar fossa; and the pharynx.

RESULTS

For purposes of comparison one mark was given if the staining had reached the area at all; two marks for good staining; and three marks for powerful staining. The averages of the results noted by three observers are shown in the table.

AVERAGE OF MARKS FOR STAINING IN FIFTY SUBJECTS

	Anterior pillar of fauces	Uvula	Tonsils or tonsillar fossa	Pharynx
After 5 min. ..	59	47	45	11
After 15 min. ..	88	82	73	24

The areas reached and the degree of staining did not appear to be altered to any great extent after 15 min., and it was not therefore considered to be of advantage to make further estimations after that time. The volunteers were all sitting upright. The table shows that the degree of staining of the anterior pillar of the fauces, uvula, and tonsils was considerable at the end of 5 min., and much more at 15 min., though the tonsillar area was not usually so heavily stained as the other two areas. The pharynx, when reached, was only lightly stained. The marks awarded by the three independent observers showed a high degree of correlation, since the range of marks awarded was 41–48 in 5 min. and 69–78 in 15 min. for the tonsillar area, and 10–12 in 5 min. and 22–26 in 15 min. for the pharynx. Apart from these marks awarded for the degree of staining, it was found that the tonsillar area was not reached in 5 min. in 19 volunteers, and not reached in 15 min. in only 2. The pharynx, however, was not reached in 5 min. in 39 volunteers and not reached in 15 min. in 26. These figures were agreed by all three observers except for two tonsillar areas and one pharynx, where opinion differed.

CONCLUSIONS

From these experiments it appears that, with a gelatin base, dyes reached the tonsillar area to a sufficient extent to suggest that drugs administered in the same type of base should reach the tonsils in the great majority of cases. It is possible that the difference between the results recorded in these experiments and those obtained by Vollum and Wilson (1945) and Arnett (1943) are due to the stickiness of the gelatin base, since it has been found while trying different types of base that the spread appears to be greatly enhanced by viscosity of the medium, and we regard the base as of great importance where local treatment of tonsillar inflammation with any drug contained in a dissolving medium is intended.

The lack of staining of the pharynx shown in so large a proportion of the volunteers (where staining was present it was only slight, even with the use of this sticky gelatin base) suggests further that any attempt to treat pharyngitis with drugs contained in pastilles or lozenges taken *by mouth* is foredoomed to failure. The flow of saliva at the back of the mouth and the swallowing mechanism appear to be such that the saliva does not bathe this region in the same way as it does the oral cavity.

It is known that methylene blue can be reduced in the presence of saliva containing organisms. It is not thought, however, that the lack of staining of the pharynx could be due to the dye having been reduced in the short period during which the volunteers were under observation, since (*a*) the staining of the rest of

the mucosa was intense and took a considerable time with mouth-washes, &c., to eliminate after completion of the experiment; and (*b*) 0·5 c.cm. of saliva, in which a small piece of blue pastille had been agitated to give a faint blue tint, still showed the blue tint after 48 hours' incubation at 37° C.

From these results it must be concluded that, apart from direct application with paints, sprays, or inhalation, the posterior wall of the pharynx cannot be reached with drugs in effective concentration from the mouth, thus differing from the tonsillar area. The nasal route offers an alternative for indirect application of medicaments for the treatment of pharyngitis, and in view of the apparent futility of attempting to treat the condition from the mouth it appears that more attention should be paid to the possibility of treatment by this route.

We wish to record our gratitude to the volunteers who suffered these oral chromatic disturbances with considerable sang froid.

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THE "PERFECT A P"

HOW IT WORKS

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TWENTY years ago, when I encountered my first artificial pneumothorax, nobody bothered to explain how it worked. It appeared obvious: the air "splinted" the lung, and that was all that there was to it. But in course of time it became evident that this simple analogy did not cover all the observed facts, nor did it account for the many disappointments and anomalies with which AP therapy is fraught. Today many are encountering AP for the first time. I therefore feel it is high time that a dogmatic credo should be promulgated, at least as a basis for discussion; perhaps even for acceptance in whole or in part until some wider-embracing hypothesis is forthcoming. The following observations are therefore intended to be simple, definite, and provocative.

DEFINITION

The Perfect AP is one which:

(1) *Relaxes tension* in the neighbourhood of a diseased zone of lung-tissue so that the lesion may take up the position best suited to its healing.
(2) *Immobilises* the diseased zone of lung-tissue.

When these two desiderata can be achieved, the induction of the AP marks a dramatic turning-point in the clinical course of the disease-process.

EXAMPLE

The simplest example of the Perfect AP occurs in the case where the disease is located in one lobe only, and where there are no pleural adhesions. Radiologically it can be seen (figs. 1*a* and *b*) that the diseased lobe (in this case the left upper lobe) has retracted into the position best suited to its healing, and is now immobile. The reason why this happens must be that there is greater internal retractive tension within a diseased zone than in healthy lung-tissue. From now onwards the healthy lobe has to perform the work of both lobes. An AP does not appreciably diminish the volume of air breathed in and out of the hemithorax. There is no reason why it should. The thoracic cage expands and contracts and the diaphragm rises and falls as much as they did previously. Assuming that the mediastinum is rigid, the tidal flow through the left bronchus will remain unaltered. On radiological screening the lower healthy lobe will be seen to show far greater movement than was possible hitherto. On full inspiration it may expand so fully that visceral and parietal pleuras rub together; on full expiration it contracts down so that its edge may be two inches and more from the chest wall.

In other words, the Perfect AP not only enables the diseased lobe to retract, but must also give additional breathing-space for the healthy lobe to perform the breathing of the entire hemithorax.

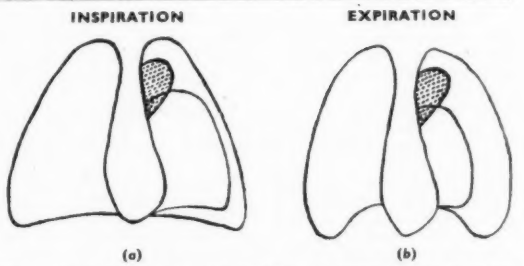

Fig. 1—The "Perfect AP." No adhesions. Diseased lobe relaxed and immobilised while healthy lobe functions for both.

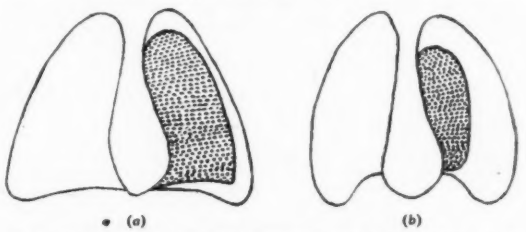

Fig. 2—No adhesions. Diseased lung gains partial relaxation, but its movement is increased.

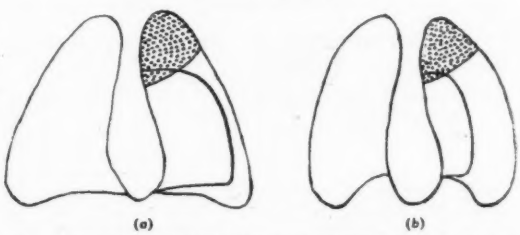

Fig. 3—Adherent diseased lobe gains no apparent relaxation, but can rest immobilised while healthy lobe functions for both.

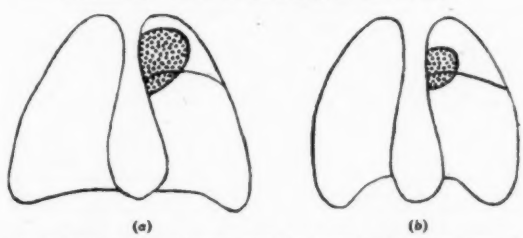

Fig. 4—Free diseased lobe gains partial relaxation, but its movement is increased. Adherent healthy lobe cannot function for both.

When the mediastinum is pendulous, its swing is towards the AP in inspiration and towards the opposite lung during expiration. This movement decreases the tidal flow on the AP side and increases it in the contralateral lung. Seeing then how a swinging mediastinum lessens the work of the affected lung, it would appear foolish to attempt to "anchor" it—unless of course there be disease in the contralateral lung.

Effect of Posture.—X-ray screening shows that in lateral decubitus the lower hemidiaphragm has a far greater respiratory excursion than the upper, and furthermore that the mediastinum sags into the lower lung during expiration. Consequently the vital capacity of the lower lung is increased and that of the upper lung is diminished. This can be confirmed by differential bronchospirometry.

It is therefore advantageous for the patient to sleep on the side of his sound lung, for by so doing he cuts down the work of the diseased lung.

Effect of Pleural Reaction.—In the later stages of an AP—after weeks or months—it will most likely show a pleural reaction, the sequel to which is thickening of visceral and parietal pleuras alike. The former can be observed radiologically, the latter by the increased resistance encountered by the refill needle. Movements of the thoracic cage and diaphragm are both thereby diminished on the affected side, and so therefore is the lung's work also. This is particularly noticeable after a pleural effusion and may well account in part for the clinical improvement which so often follows this complication.

SIMPLE VARIETIES OF LESS-PERFECT APs

Perfect APs are rare. Less-perfect APs may achieve one or other or neither of the two desiderata. In the next example the disease, instead of being localised in one lobe, is scattered throughout the whole lung. It will be found (figs. 2*a* and *b*) that the entire lung retracts equally and that both lobes will continue to expand and retract during respiration. Actually the range of movement will be increased. In full inspiration the lung edge is much nearer to the chest wall than in full expiration. Thus there is achieved a certain amount of retraction but apparently no immobilisation. And yet this type of AP may occasionally prove beneficial clinically. To explain this we must postulate a condition of "internal selective relaxation and immobilisation"—i.e., a condition where the scattered lesions can each take up the "slack" afforded by the diminished volume of the lung as a whole (and consequently the diminished "mean" tension in its stroma). Thus they can rest and retract while the remaining healthy lung-tissue does all the work.

Effect of Selective Adhesion.—The commonest form of imperfect AP is the one wherein the lesion-containing zone or lobe is adherent to the chest wall, while the healthy lobe is free (figs. 3*a* and *b*). Such an AP is often condemned as "contraselective" and abandoned forthwith. Striking clinical improvement, however, may sometimes occur in spite of apparent failure to relax the diseased area, because the healthy lobe has been enabled to take over some of the diseased lobe's work. The diseased lobe may thus be getting nearly as much rest as it does in the Perfect AP, although its tension may remain unaltered.

In this connexion it must be remembered that an anteroposterior photograph may be misleading. There may be "AP air" both in front and behind a lobe which looks completely adherent to the axillary margin, and which may be enjoying more relaxation than the picture suggests. A wedge looks triangular viewed from one direction and rectangular from another!

Effect of Contraselective Adhesion.—Occasionally the diseased lobe is found to be free while the healthy lobe is adherent (figs. 4*a* and *b*). This is often welcomed as a "Selective AP." But it is by no means a perfect state of affairs. The healthy unrelaxed lobe can perform its own share in respiration and no more. The relaxed diseased lobe has to perform its full share, and has moreover to suffer a greater range of movement. Any improvement in such a case must again be due to "internal selective relaxation and immobilisation," the lesions taking up the "slack" afforded by the diminished mean tension within the lobe.

SUMMARY AND CONCLUSIONS

The Perfect AP is one which brings full relaxation and immobilisation to the diseased zones of a lung.

Full relaxation and immobilisation of any diseased zone in the lung is only possible when the healthy areas are given enough breathing-space to cope with the entire tidal flow.

An AP is a dynamic condition whose efficacy cannot be gauged by an X-ray snapshot in full inspiration. A better impression can be gained by screen examination of the respiratory cycle; but the final assessment must always be on clinical progress.

It is possible to discuss AP therapy without (mis)using the word "collapse."

No claim to originality is made for the foregoing observations. Subsequent research has shown that they were all implicit in Parry Morgan's masterly exposition more than 30 years ago.

TOXIN AND ANTITOXIN STUDIES OF GAS-GANGRENE IN MAN*

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MAJORS RAMC

THE commonest cause of gas-gangrene in man is *Clostridium welchii*. In vitro this organism elaborates a powerful and complex exotoxin, the action of which in vivo is generally believed to be responsible not only for the rapid spread of the disease but by its wider dissemination for the profound toxæmia and high fatality. The fact that the administration of antitoxin has been shown to have therapeutic value lends support to such a view.

One component of the toxin—the so-called "alpha-toxin"—contains a lecithinase that produces visible opacity in previously clear solutions of filtered egg-yolk. This reaction can be used as an indicator to detect the presence of small amounts of alpha-toxin, and also to estimate its concentration; moreover, by the use of standard toxin, the presence and concentration of its specific antitoxin may also be determined. Thus a quantitative study is possible of the distribution of alpha-toxin and antitoxin in the different tissues and exudates obtainable in cases of gas-gangrene in man and experimentally in animals. It was hoped that in this way an early and specific diagnostic test might be evolved and also a simple method of controlling serum therapy.

The solution of filtered egg-yolk has been called "lecitho-vitellin" by R. G. Macfarlane and his co-workers (1941), and the reaction between it and alpha-toxin is, therefore, generally referred to as a lecitho-vitellin or LV reaction.

Its simplicity makes the lecitho-vitellin reaction suitable for work in the field. As regards its sensitivity, we have found, under our conditions, that 0·002 alpha units of toxin per c.cm. (final concentration) will produce a definite opacity in 1 hour, and that 0·0005 alpha units are detectable if the reaction is allowed to proceed for 24 hours. Thus it should be possible to detect toxin in a final concentration of about 0·03 mouse MLD per c.cm. In practice, certain factors have reduced this sensitivity, particularly the presence of large amounts of protein in the fluid to be examined. Human serum depresses the lecitho-vitellin reaction, and we have found it necessary, in the actual tests, to dilute the serum or serous exudates 1 in 10 final concentration, with the result that we can detect toxin in such fluids only if it is present in a concentration of 0·005 alpha units (or approximately 0·3 MLD) per c.cm.

Furthermore, ionised calcium is necessary for the lecitho-vitellin reaction, and a second difficulty in the detection of toxin has been the presence of phosphate, particularly in muscle extracts, urine, and, to a lesser extent, in wound exudates. It was known that phosphates inhibit the lecitho-vitellin reaction, presumably by removing ionised calcium, and it has been our practice to make the necessary dilutions in calcium chloride borate-buffer solution. Certain difficulties are now apparent. If the test is carried out at a pH greater than 6·0, then before the required excess of ionised calcium can be obtained the soluble phosphate is precipitated as insoluble calcium phosphate. We have recently found, however, that free toxin is strongly adsorbed by calcium phosphate, about 5 MLD of toxin being removed by 1 mgm. of phosphate. The amount of phosphate in muscle extracts and exudates that we have examined is not known, but when precipitated with calcium chloride it might have been enough to adsorb small amounts of toxin originally present. Experiments carried out on our return to England suggest that, in the case of normal human muscle, the technique we used in the field might result in the loss of 2 MLD or less per gramme of muscle extracted. In vitro it is possible to elute toxin so adsorbed on calcium phosphate by means of a dilute solution of sodium carbonate, and in this way toxin can be concentrated. Such a technique has latterly been applied to clinical material—but without success.

* Based on a report to the War Office (Nov. 2, 1944) on work done in NW Europe since June, 1944.

The presence of antitoxin, of course, will also prevent the detection of toxin by ordinary means, and it must be taken into account when the results are considered. This point will later be discussed in more detail.

The anti-alpha-toxin can be titrated quickly and easily by means of the lecitho-vitellin reaction. For this purpose we have used standard toxin that we have checked by frequent titrations against standard antitoxin, and the results obtained on a series of antitoxic sera agreed within 15% with results of parallel titrations by Dr. C. L. Oakley of the Wellcome Physiological Research Laboratories.

MATERIAL AND METHODS

The material examined has been obtained from battle casualties in NW Europe, including 33 cases of typical gas-gangrene (clostridal myositis). In three of these we were unable to carry out full bacteriological investigations. However, we examined each of these cases personally and have no reason to doubt the accuracy of the diagnosis. Of the 30 cases in which cultural data are available, *Cl. welchii* was isolated in 26. A full account of the bacteriological studies will be published elsewhere.

Test for the presence of lecithinase.—Fluids were diluted 1 in 5 with calcium borate buffer and one volume of this was incubated at 37° C with one volume of lecitho-vitellin solution (Macfarlane et al.). The solid tissues were ground up in a pestle and mortar with saline in the proportion of 1 c.cm. to 1 g. (wet weight). The supernatant fluid was diluted 1 in 5 with calcium borate buffer and the test carried out as above. Results were read at 30 minutes, 4 hours, and 24 hours. In all cases antitoxin controls were put up.

Titration of antitoxin.—Serum and exudates were diluted 1 in 5 with saline; solid tissues were extracted as before. Toxin dilutions were made in 0·5% gelatin-saline. One volume of the diluted serum or extract was allowed to react with one volume of diluted toxin in the presence of one volume of calcium borate buffer for 15 minutes at room temperature. Then one volume of lecitho-vitellin was added and the test read after half an hour in the 37° C bath. Usually a preliminary titration was made with a wide range of toxin dilutions, followed by a final titration at narrow intervals. The antitoxin concentration was determined by comparing the results with those of a similar titration, using standard antitoxin diluted to the appropriate level with human serum. The same batch of human serum was used throughout.

Tests for hyaluronidase.—The technique employed was that described by McClean and his colleagues (1943) as the "Mucin Clot Prevention Test." Muscle was extracted as for the lecithinase test, except that distilled water was used in place of saline. In all cases a known positive control was put up in parallel.

Bacteriological examination.—Routine examination of the aerobic and anaerobic flora of our cases was carried out.

Examination of Clinical Material

THE ALPHA-TOXIN

At the beginning of this investigation, it was expected that the exudate from gas-gangrenous lesions would contain demonstrable alpha-toxin, and that the lecitho-vitellin reaction might be of value in diagnosis. In support of this expectation were the experimental findings of McClean and his co-workers (1943, 1944), and our own experience that experimental post-mortem inoculation in man of *Cl. welchii* resulted in fluid from the site of inoculation that gave strongly positive reactions.

But with actual clinical materials these hopes have not been realised. In 27 cases of established gas-gangrene, no positive reaction could be obtained within 4 hours with wound exudate or muscle extract, although in 4 a reaction was observed after 24 hours; but such a delay destroys any practical value of the reaction as an aid to diagnosis. Moreover, in 3 of these 4 cases material was obtained post mortem so that the toxin demonstrated may have been produced after death, and in 1 *Cl. welchii* was not present at all, the only pathogenic clostridium isolated being *Cl. œdematiens*. (It may be noted that the reaction in this case could be specifically neutralised by *Cl. œdematiens* antitoxin.) In material from 40 cases of anaerobic wound infection other than gas-gangrene entirely negative results have been obtained, and in most of these *Cl. welchii* is also known to have been present.

It is clearly of interest and some importance to establish the reasons for this failure to demonstrate free toxin. It is possible (*a*) that the toxin was actually present in exudates or extracts, but for some reason the lecitho-vitellin reaction was inhibited; (*b*) that the toxin was present, but was bound to antitoxin or some other substance that masked its activity; or (*c*) that toxin was absent.

Attempts have been made to differentiate between these possibilities, as follows:

(*a*) *Toxin Present, but Reaction Inhibited.*—No serious inhibition of the lecitho-vitellin reactivity of minimal amounts of toxin has been produced by the addition of serum, exudate, or muscle extracts, if these have been diluted and recalcified as in the actual testing for toxin, and, of course, if they do not contain antitoxin. Therefore it may be inferred that non-specific inhibition of the lecitho-vitellin reaction by some substance in these materials is not a likely explanation of our negative findings.

(*b*) *Toxin Present, but Inactive.*—The presence of antitoxin in the test material would obviously explain failure to demonstrate free toxin. Of the 27 cases examined 20 are known to have had antitoxin circulating in the blood-stream at the time of our taking the muscle or exudate, or at death; of these 20, 19 gave negative reactions, and 1 a positive in 24 hours. Seven cases had no antitoxin; from these, material was obtained from 3 that gave reactions positive in 24 hours, 1 being an exudate taken in life, the others being post-mortem material. From the higher incidence of positive reactions in cases without antitoxin, it might be supposed that the obvious explanation of the failures in the other cases is the presence of antitoxin in exudate and extracts. But in 4 fatal cases of gas-gangrene due to *Cl. welchii*, in which there was no circulating antitoxin, no free toxin could be demonstrated in any fluid, muscle, or organ examined.

In our attempt to circumvent the inhibition of the reaction by antitoxin, which in practice is given to most suspected cases before exudates or tissues are available for examination, the possibility of breaking down the toxin-antitoxin complex has been studied. Many experiments in this direction have been made. Partial success has been achieved by heating the mixture of toxin and antitoxin. The toxin itself is relatively heat-stable, whereas antitoxin is rapidly denatured at 90° C. It has been found that, from a mixture of 1 unit of toxin with 2 units of antitoxin, about 50% of the original toxin can be set free by heating in the presence of calcium chloride. If the excess of antitoxin is increased to four-fold, about 25% of toxin is recoverable, and about 12·5% if there is an eight-fold excess of antitoxin. Though the available toxin is reduced, probably as a result of adsorption on to denatured serum-protein, the process might have been expected to increase the chances of demonstrating toxin in cases treated with serum. But its application to exudates, extracts of muscle, and various organs from 10 cases of gas-gangrene has given uniformly negative results.

Our failure to demonstrate the presence of active lecithinase in material from fatal cases, combined with the failure to release toxin from antitoxin in treated cases, suggests that in our human material the lecithinase is not present in wound exudates or muscle extracts in concentrations approaching those reported by McClean and his collaborators in experimental animal infections, in which up to 75 MLD per gramme of muscle might be found. It is possible, of course, that some toxin actually present in our material may have been adsorbed by precipitated calcium phosphate, as we have already indicated. However, experiments with normal human muscle to which known amounts of toxin were added show that a minimum concentration of from 1 to 2·5 MLD per gramme of tissue can be detected by the technique used in the field.

(*c*) *Toxin Absent.*—The possibility that the alpha-toxin is not released into exudates or tissue fluids during life because it is at once fixed by living tissues is next to be considered. Evidence of such a fixation in animals has already been obtained as in the following experiments—

Thirty-three alpha units of toxin was injected into the ear-vein of a rabbit. During and after the injection, which took

five minutes, blood samples were taken from the other ear at short intervals until the animal died 13 minutes after the injection was finished. The blood-samples taken during the injection showed hæmolysis, but no free toxin could be demonstrated in these, or in any subsequent sample, although, by simple dilution of the toxin in the circulating blood-volume, about 0·3 alpha units (or over 30 lecitho-vitellin reacting doses) might be expected in each c.cm. of serum. After the death of this animal, the tissues and organs were extracted and tested for free toxin, but none could be found.

The second experiment was carried out in order to determine how long toxin injected into a living muscle remained in situ. A rabbit was given 2·2 alpha units of toxin (1 c.cm.) at 30-minute intervals, each injection being into a different muscle. A green dye had been added to the toxin to mark the exact site of injection. Ten minutes after the fourth injection, the animal was killed with chloroform, and the four muscles were removed. A fifth uninjected muscle was also dissected out and at once injected with 1 c.cm. of the toxin-dye solution. This last muscle was then incubated for 30 minutes. The green-stained tissue from the 5 muscles was then dissected out, examined for necrosis, and extracted with saline. The extracts were tested for free toxin by the lecitho-vitellin (LV) method, with the following results. There was no hæmolysis of the post-mortem blood.

Time of Injection	*State of Muscle*	*LV Reaction of Extracts*
90 min. before death ..	Necrotic	Negative after 8 hours
60 min. before death ..	Slight necrosis	
30 min. before death ..	Normal ..	Trace in 8 hours
10 min. before death ..	Normal ..	Trace in 4 hours
10 min. after death ..	Normal ..	Strong positive in 30 minutes

Toxin has been absorbed with serum and whole blood, and with slices and emulsions of fresh muscle, liver, kidney, lung, and heart, but without any significant reduction in its lecithinase activity; these absorptions have been made under different conditions of pH and temperature, and in varying concentrations of calcium and other salts.

Nevertheless, working on the assumption that lecithinase was fixed by tissues in relation to the gas-gangrenous lesion or by other organs in the body as a whole, we have attempted to set it free, or—failing this—to demonstrate its presence by indirect means. Tissues have been extracted with a variety of agents and methods. Acids, alkalis, different salts in different concentrations, protein precipitants and denaturants, heat, and freezing and thawing, have been applied to emulsions of the tissues, but without effect. Digestion by proteolytic enzymes has been tried, but this was found to destroy toxin.

In an endeavour to demonstrate fixed but still active lecithinase, the tissues and exudates have been left in contact with known amounts of antitoxin, since the fixed toxin might be able to combine with the antitoxin and therefore reduce its effective concentration. But no significant reduction of antitoxin has been demonstrated after contact with tissues from cases of gas-gangrene as compared with normal control tissue. At first we thought there might be a difference in the amount of toxin that could be absorbed by normal tissue, as compared with tissue from gas-gangrenous lesions that should be already saturated with toxin. But, as we have already said, normal tissue in vitro seems to be incapable of combining with significant amounts of toxin, so that experiments in this direction were negative from the outset.

We may say here that hyaluronidase tests (the mucin-clot prevention test of McClean and his co-workers) have been carried out in 15 cases of gas-gangrene in which *Cl. welchii* has subsequently been identified by cultural methods. In all but 3 of these cases antitoxin had been given before collection of the wound exudate and muscle tissue. Of these 15 cases, 3 gave a positive reaction. Two of these positive reactions occurred with material taken after the administration of antitoxin—one with the wound exudate (but not with muscle-extract) of a man who had received 198,000 alpha units of antitoxin in the 24 hours before death. But in this instance the wound exudate had been obtained after death. In several instances, material that gave negative lecitho-vitellin reactions when tested in the fresh state subsequently gave positive reactions when two or three days old. It is suggested that toxin was produced in vitro in these materials by the continued growth of the organism. In no instance did the cases giving positive lecitho-vitellin reaction and positive hyaluronidase coincide. One case of *Cl. œdematiens* infection however (not included in the above series) did give both reactions on post-mortem material, and both could be neutralised by a specific antiserum.

THE ANTITOXIN

In this series, antitoxin titrations have been used to study (*a*) the level of circulating antitoxin that results from injections of a known amount, a figure that may give information on the circulating plasma volume; (*b*) the rate of disappearance of antitoxin from the circulation in normal controls, gas-gangrenous cases, and other wound infection; (*c*) the distribution of antitoxin in various tissues after its injections; (*d*) the relationship of circulating antitoxin to the clinical progress of the disease.

(*a*) *Levels of Circulating Antitoxin.*—Initial levels of circulating antitoxin a few minutes after a single intravenous injection of a known amount have been determined in 5 normal volunteers and 35 cases of wound infections, of which 16 were established cases of gas-gangrene.

In 4 of the normal volunteers it was found that 10,000 alpha units raised the circulating antitoxin by 3·75–5·0 alpha units per c.cm. of serum, giving a range of circulating plasma values of from 2·7 to 2·0 litres, the figures being approximately proportional to the weight of the subject. The 5th volunteer, who had a vaso-vagal attack after the injection, showed a high antitoxin level (7 alpha units), giving an inferred plasma volume of only 1·4 litres. In the 19 cases of wound infection, other than gas-gangrene, the mean rise per 10,000 alpha units injected was 3·8 alpha units per c.cm., giving a mean calculated plasma volume of 2·6 litres. The lowest calculated volume was 2·0 litres and the highest was 4·3 litres, except for one case in which the figure was 5·9 litres, suggesting a mistake in some part of the estimation. Of the 16 cases of gas-gangrene, 11 recovered, and in these the mean plasma volume was 2·5 litres. Five of the patients were acutely ill at the time of injection and died a few hours afterwards; in these the mean plasma volume was 1·7 litres—a figure that is suggestively low but may not be significant in view of the small number of observations.

The intramuscular injection of 20,000 alpha units into 3 normal volunteers did not produce a significant rise in the circulating antitoxin until 12–24 hours had elapsed. The maximum level was attained about 48 hours after injection, and represented a rise of 1·25–2·25 alpha units per c.cm. per 10,000 alpha units injected—that is, about a third of the figures recorded immediately after intravenous injection. These findings have been confirmed by further observations in the field.

(*b*) *Rate of Disappearance of Antitoxin.*—The rate at which antitoxin disappears from the human circulation after its intravenous injection was determined by 12 or more serial estimations in each of 5 volunteers. The results showed a fairly regular logarithmic diminution amounting to 25–30% per day, or about 1·2–1·5% per hour. Two subjects, who had severe serum reactions on the 6th day after injection, showed, on that day, a rapid fall in the circulating antitoxin; the other 3 subjects had small amounts still circulating 10 days (and in one case, 15 days) after injection. In one subject, who had a vaso-vagal attack after injection, a rapid fall of antitoxin level was observed during the first few hours after injection, but in the other four the rate of disappearance was regular from the beginning. These findings are of particular interest in that we did not see the initial rapid fall observed by Glennie and collaborators (1922, 1923, 1929) working with diphtheria antitoxin in guineapigs and rabbits. It was Glennie's view that this rapid fall was due to the antitoxin diffusing into the tissues until equilibrium was reached. It appears that in the human subject such diffusion is much slower.

It is harder to determine the rate of disappearance of antitoxin in clinical subjects in the field because serial blood samples may be impossible to obtain for many reasons, and the figures recorded are difficult to interpret

because of the disturbances in blood-volume produced by shock, blood and plasma transfusions, and hæmorrhage. Some idea of the rate of disappearance has been obtained in 20 patients, 10 of whom had gas-gangrene and the rest other wound infections. Of the 10 without gas-gangrene, 3 showed the normal rate of disappearance and 7 had an increased rate, in one case up to 90% in one hour. These very rapid disappearance rates were usually—but not always—associated with obvious allergic manifestations, and the underlying mechanism is not clear.

In view of this variability in patients not thought to have gas-gangrene, little reliable information can be obtained on a possible increased rate of usage of antitoxin in true gas-gangrene. Of the 10 patients with gas-gangrene, 3 (including one severe and subsequently fatal case) did not destroy antitoxin unduly fast. In the other 7, rates of destruction varied from 50% per day to nearly 100% per hour, high rates of disappearance again being associated in some cases with severe reactions. Very large amounts of serum disappeared in some of these patients; in one the rate of destruction increased steadily during a prolonged course of serum therapy, until the level of the circulating antitoxin was falling rapidly despite the injection of 108,000 alpha units per day. In another, 450,000 alpha units were given as a drip transfusion over a period of 3 hours, but produced only a negligible rise in circulating antitoxin.

(*c*) *Distribution of Antitoxin in Tissue and Body Fluids.*—The antitoxin content of normal and affected muscle and of wound exudates obtained at operation has been estimated in 23 cases, including 10 cases of gas-gangrene. The antitoxin content of liver, lung, kidney, heart, normal and affected muscle, and any serous effusions or exudates has also been estimated in a further series of 11 fatal cases, of which 9 were suffering from gas-gangrene. In all these patients antitoxin was known to be circulating in the blood-stream at the time of death, or of the operation at which the biopsy specimens were taken. Antitoxin was estimated in extracts of the different tissues; when present, it appeared to be in a diffusable form, since the solid tissue had only a negligible antitoxic value after extraction. The least amount detectable by the method used represents about 0·125 alpha units per gramme of wet tissue. The occurrence of antitoxin in concentrations above this minimum are given in table I.

TABLE I—DISTRIBUTION OF ANTITOXIN IN ORGANS, TISSUES, AND BODY FLUIDS

Tissue	Gas-gangrene cases		Other wound infections	
	Total	With antitoxin	Total	With antitoxin
Affected muscle ..	19	12	15	11
Normal muscle ..	15	3	10	0
Wound exudate ..	15	13	3	1
Heart muscle ..	9	3	2	0
Liver	9	3	2	0
Kidney	9	3	2	0
Pericardial fluid ..	5	3	—	—
Peritoneal fluid ..	2	1	—	—

It will be seen that antitoxin is more likely to be present in pathological material (necrotic and infected muscle, exudates, and transudates) than in normal tissue. In 2 cases where normal muscle is recorded as containing antitoxin, only minimal amounts were found. In affected muscle, even in the active gas-gangrenous lesion, much higher concentrations existed, the concentrations in these affected tissues being roughly correlated with the blood level. This is of interest in view of our previous finding that antitoxin appears to be slow in leaving the normal circulation. Exceptionally high concentrations of antitoxin were found in the tissues and organs of one man who received 450,000 alpha units of antitoxin 12 hours before his death from gas-gangrene; assay of antitoxin in the post-mortem tissue gave the following results, expressed as units per gramme or per c.cm.:

Heart blood, 150; affected muscle, 7·5; normal muscle, 1·25; wound exudate, 20; heart muscle, 2·5; liver, 2·5; kidney, 11; peritoneal fluid, 50; pericardial fluid, 2; cerebrospinal fluid, 1; urine, 6.

(*d*) *Relation of Circulating Antitoxin to Clinical Progress.*—Of the 33 cases of gas-gangrene studied, 28 received antitoxin intravenously. The more relevant data on these 28 cases are shown in table II.

TABLE II—SEROTHERAPY IN GAS-GANGRENE

Data	Fatal cases	Recovered cases
Total no. of cases	12	16
Serum Therapy		
1. Dosage (units)—Range ..	27,000–585,000	27,000–198,000
Mean	170,000	88,000
2. Mean duration	30 hours	—
3. Hours between wounding and serotherapy—		
Range	24–120	23–168
Mean	51	71
4. Antitoxin in blood—		
Present in	9 cases	14 cases
Absent in	3 cases	(2 cases not known)
Minimum level	0·5 unit/c.cm.	1·0 unit/c.cm.
Maximum level	150 units/c.cm.	88 units/c.cm.
5. Antitoxin in exudates and tissue—		
Present in	7 cases	8 cases
Absent in	3 cases	1 case
	(2 not known)	(7 not known)
Minimum level	0·5 unit/c.cm.	"trace"
Maximum level ..	7·5 units/c.cm.	1·5 units/c.cm.

From these data it emerges that the presence of an excess of antitoxin in the blood-stream and wound area will not of itself prevent a fatal outcome. It must be assumed either that (*a*) death is directly due to the general action of lethal toxin produced by the organisms or (*b*) that death is due to some other indirect effect of the disease process. If death is directly due to toxin and cannot be averted by antitoxin, then we must assume: (1) that vital tissues have been irreparably damaged by toxin before antitoxin is given, or (2) that the antitoxin cannot protect them from circulating toxin.

As regards the first of these alternatives—that the tissues have been irreparably damaged—all those cases in our series have recovered in which the surgeon has been able to remove all affected tissues, and this suggests that such irreparable damage does not occur in the early stages of the disease. Antitoxin was given in these recovered cases at about the same time after wounding or even later, and on the average at the same stage in the actual disease, as in those fatal cases in which radical operation was anatomically impossible.

As regards the second possibility—that antitoxin cannot protect the tissues from circulating toxin—little can be said at the moment. Experimentally, we have found that 300 alpha units of antitoxin, given intravenously to a rabbit, did not protect against the injection, two hours later, of 90 alpha units of toxin also given intravenously over a period of about ten minutes. But the same amount of antitoxin did protect a rabbit against death from 45 alpha units of toxin given in the same way, though some intravascular hæmolysis occurred. These experiments suggest that circulating antitoxin should be able to nullify even a rapid flow of toxin if the total amount of toxin entering the blood-stream is not more than about a sixth of the equivalent amount of antitoxin already given intravenously. On this basis, since some of our cases have had more than 500,000 alpha units of antitoxin intravenously in a few hours, the amount of toxin required to kill would be about 80,000 alpha units—an amount that would be contained in more than 20 litres of toxin as produced in vitro under optimal conditions.

Therefore it seems possible that death in such treated cases may not be due to the direct action of the toxic filtrate in common use as an antigen but to the continual absorption of some other substance.

Discussion

The foregoing observations indicate that, contrary to previous animal experimental work (McClean et al.), it is not easy to demonstrate lecithinase or hyaluronidase in human infections with *Cl. welchii*. In only 4 cases were positive lecithinase reactions observed, and in 3, since the material was obtained post mortem, the production of toxin after death cannot be excluded. The reactions, moreover, were too delayed to be of any practical value in the diagnosis and treatment of the disease in the living. It must be admitted, however, that our technique for extraction of infected tissue is not identical with that employed by McClean. At the outset, McClean's calcium borate buffer (pH 7·2) was used, and with it we obtained negative results from 2 fatal cases of gas-gangrene due to *Cl. welchii* in which no antitoxin had been given. Later a more alkaline calcium borate buffer (pH 7·8) was adopted. At the pH of both these buffers calcium phosphate is precipitated, and, as already indicated, toxin present during its precipitation will be adsorbed. We feared, therefore, that the technique used might have removed the lecithinase we were seeking if appreciable amounts of soluble phosphate were being extracted from the muscle samples. But later experiments suggest that this is an improbable explanation of our negative findings as compared with McClean's results in animals, unless the amount of phosphate extractable from gas-gangrenous muscle is much greater than normal. Dr. M. G. Macfarlane informs us that the phosphate content of affected muscle is, in fact, abnormally low, and her data are largely based on material obtained from cases in the present series.

It appears more probable that any lecithinase produced in the natural infection is rapidly fixed or removed in vivo. This is certainly true for lecithinase injected into rabbits. We have made many attempts to liberate any lecithinase so fixed in human material, but without success. Finally, although we have obtained negative results in the absence of antitoxin, most of our cases had, in fact, received it; and this is a factor that must be borne in mind when the merits of a diagnostic test depending on free toxin are being considered.

Of greater practical interest is the fact that in 9 cases an excess of antitoxin in the blood-stream for anything up to 92 hours before death has failed to prevent a fatal termination to the disease. It is significant that in all these cases the lesions were such that the surgeon was unable to remove all the affected muscle at the time of operation, and that there was evidence that the local disease had extended during the period of serum therapy. Therefore it must be concluded (*a*) that circulating antitoxin is incapable of arresting the local spread of gas-gangrene, and (*b*) that circulating antitoxin will not prevent death, apparently from toxæmia, as a result of this local infection.

In connexion with the first conclusion, it is possible that the low antitoxin titre that we have observed in normal muscle may explain the failure of serum therapy to prevent the local spread of the disease. Antitoxin has been shown to be present in much greater amounts in the exudate and in dead muscle, but the toxin will also diffuse into normal muscle, presumably destroying it and producing a further nidus for invasion by the clostridia themselves. The presence of antitoxin *behind* the advance of the infection is of no benefit to the patient.

With regard to the second conclusion—that antitoxin will not of itself prevent death from toxæmia—the question at once arises whether death is due to the products of tissue breakdown rather than the direct action of bacterial toxin. And this is a problem which can be more profitably discussed in the next paper.

Summary

By the lecitho-vitellin reaction it is possible to make sufficiently reliable titrations of alpha-toxin of *Cl. welchii* and its corresponding antitoxin for observations in the field.

As diagnostic procedures in early gas-gangrene neither the lecitho-vitellin nor the hyaluronidase tests have proved satisfactory.

In 27 cases of gas-gangrene—almost all caused by *Cl. welchii*—free alpha-toxin has been detected in 4. In only one instance, however, was a positive reaction obtained with material taken during life.

The possibility that the profound toxæmia of gas-gangrene is not due solely or even primarily to alpha-toxin has been discussed.

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Medical Societies

ASSOCIATION OF CLINICAL PATHOLOGISTS

THE summer meeting of this association was held in London on July 20 and 21, with Dr. ERIC WORDLEY, the president, in the chair.

Prof. J. H. DIBLE spoke on the *pathology of infective hepatitis with special reference to hepatic biopsy*. After demonstrating the method of liver puncture by the transpleural route with suction of a small piece of liver substance into the cannula by means of an attached syringe, and describing the alcohol-free fixation to preserve glycogen, and the staining used, he produced a series of slides illustrating the histological appearances in infective hepatitis. The essential features were rarefaction at the centre of the lobule with derangement of columns of cells, the appearance of bizarre forms with swollen cells associated with a cellular infiltration of the bile-ducts, and generally a reduction in the width of the lobule. There was, however, good retention of the reticulin arrangement of the liver lobule. Dr. Dible demonstrated varying degrees of these changes in various forms of jaundice, including infective jaundice, serum jaundice, and neoarsphenamine jaundice, and suggested that the icterogenic agent was similar and that the toxic pathological changes seen after biopsy were also similar.

Major C. E. VAN ROOYEN described the *rapid diagnosis of smallpox* by demonstration of elementary bodies from the vesicles. From his experience of several hundred cases in the Middle East he maintained that this was a simple matter and their recognition to a trained observer was reliable. The findings had been proved correct in several cases in which they were doubted because at first the clinical appearances were atypical. A second paper dealt with *rickettsial agglutination tests in typhus*.

Prof. A. D. GARDNER read a paper on the *laboratory diagnosis of Weil's disease*. He had investigated material from 900 suspected cases and had found 150 positive. From his records it was clear that jaundice was not always present and that the non-icteric cases probably had a better prognosis. Case-mortality in the series differed with age; in old people it was 50% but in young people only 5%, the overall mortality being 12%. The agglutination tests had been carried out with formolised suspensions of the leptospira which had been grown in 12% rabbit serum in glass-distilled water. These suspensions had remained stable in his hands for years. Dr. Gardner expressed the hope that now that penicillin shows such great promise in the treatment of the disease, attempts at diagnosis will be made earlier in the disease without waiting for jaundice, which sometimes occurred in this series as late as the 8th or 9th day, although it was commonest on the 5th.

Squadron-Leader E. M. DARMADY's paper on the *traumatic uræmia syndrome* produced an excellent discussion in which various contributors showed how the syndrome was produced by many factors, including trauma, crush, and severe transfusion reactions, all of which gave similar histological appearances in the kidneys. In this discussion Dr. JOAN ROSS described cases of anuria she had collected from the battle areas.

Dr. G. R. OSBORN dealt with the *action of thiouracil on goitres* and showed a series of sections demonstrating the main changes. Macroscopically the tumour was often hard, pure white, with no appearance of colloid—very suggestive in appearance of carcinoma. Even microscopically the changes frequently included large cells with hyperchromatic nuclei which also might be mistaken for a carcinoma. Dr. Osborn agreed that thiouracil was now the best preoperative means of treatment in the diffuse toxic goitre.

Dr. W. H. GRACE described a long series of cases of sudden death in infancy, and explained the difficulties with which even an experienced forensic pathologist might be faced when presented with a "dead infant." Asked whether he believed in status lymphaticus he answered that he regarded this as the fifth ace, to be kept up the sleeve for special emergencies.

Papers were also read by Dr. M. O. SKELTON, who demonstrated fatal *tracheo-bronchial diphtheria* in an infant of five weeks. Dr. R. A. O. WILLIAMS spoke on the value of preliminary fluid culture for the *isolation of pyogenic cocci* when a larger yield is desired. Dr. A. F. SLADDEN spoke on the *routine examination for diphtheria*, using a tellurite-Loeffler medium which he claimed as a simple and effective substitute for the elaborate media now in use. Dr. K. B. ROGERS described a method of suspending *sedimentation tubes* in a jar of water at a controlled temperature because of the discrepancies which occurred as a result of temperature variations in this test. A discussion was opened by Dr. E. N. DAVEY followed by Dr. S. C. DYKE on the *investigation of the allergic state*. Some doubt was thrown by following speakers on the value of skin tests in demonstrating sensitivity, but generally it was held that they are of great value in indicating particularly single-allergen sensitivity.

The meeting ended with a paper by Dr. H. N. STAFFORD on *the corpse, the pathologist, and the coroner*. Expounding the duties and limitations of the pathologist in regard to the coroner, he gave his interpretation of the 1887 Coroners Act with the amending act of 1926. He made it clear that a pathologist may make a post-mortem examination if he considers, or is told, that the death is due to natural causes, and that in any case no "assault" can be committed on a corpse by so doing. The overriding consideration was that there should be coöperation between the medical men and the coroner, and the coroner must certainly not be obstructed in his duties.

During the two days there were also many demonstrations which were well attended. At the society's dinner the guests included Major-General L. T. Poole (director of pathology, War Office) and Professor Gardner.

Reviews of Books

Index of Differential Diagnosis of Main Symptoms

(6th ed.) Editors: HERBERT FRENCH, CVO, CBE, DM OXFD, FRCP; ARTHUR H. DOUTHWAITE, MD LOND., FRCP. (Wright. Pp. 1128. £4 4*s*.)

THERE is an old-world charm about this reference book that places it in a category by itself. It recalls those spacious pre-1914 days when top hats and frock coats were still de rigueur and the clock was not the tyrant it has since become. Merely to delve into the index is a pleasure: "bilberries, melæna due to"; "flatulence, inflammable gas in"; "Turkish-trouser disease." How many modern practitioners could give the six tests for death mentioned here or the 47 causes of hæmoptysis? On the other hand, it is surprising to find neither Grocco's nor Graham Steell's names among the "Proper Names" indexed. Subsultus tendinum is another unexpected omission. Dr. Douthwaite has assisted the veteran senior editor in the preparation of this edition, but obviously the principle that has been adhered to is that nothing old of value should be discarded in favour of what may prove to be transitory among recent advances. It is typical of the book that twelve of the nineteen contributors should be of the generation that has either "passed on" or is now on the consulting staff of our medical schools. The young may scoff at such a work; yet with experience they will sooner or later realise that a book like this is an essential occupant of the library of every doctor. Age cannot wither nor custom stale its infinite variety.

Handbook of Physiology and Biochemistry

(38th ed.) R. J. S. MCDOWALL, MD, D SC, MRCP. (John Murray. Pp. 898. 25*s*.)

IN spite of its gradual evolution this book retains its essential character of treating the field of biochemistry and physiology which the medical student is expected to cover in a reasonably short space. It is somewhat didactic and although references to authoritative works have now been introduced it is questionable whether the reader's curiosity will be aroused sufficiently to make him look them up. However, the problem of how to make medical students think about physiology, instead of trying to "learn" it, is a difficult one, and perhaps one should not expect to find the solution in a textbook. The author has improved the illustrations in this thoroughly revised edition.

Man and His Fellow Men

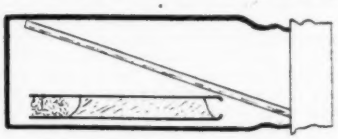
SAMUEL LOWY, MD PRAGUE. (Kegan Paul, Trench, Trübner & Co. Pp. 194. 15*s*.)

THE sub-title of this book is "Modern Chapters on Social Psychology," but there is a wide gap between Dr. Lowy's approach and that now customary in American and English schools of social psychology. He bases his study on the observations he made while practising as a psycho-analyst in Czechoslovakia and other European countries: his book is reflective and literary rather than scientific, and discursive rather than exact. The humane dispassionate tone of the writing attests the author's sincerity and his medical outlook upon the troubles of human conduct. Many readers will, however, agree with Mr. Herbert Read who, in an introduction, takes exception to Dr. Lowy's opinion that men need to be guided and compelled by an external superior authority, the State, if they are to arrive at the high intellectual and moral achievements of which they are capable. At the end of his book Dr. Lowy has a chapter, "Suggestions on General Reform," which puts this doctrine in persuasive form; he would have the State insist on tolerance and "social decency," so that it would penalise exploitation, bullying, and prejudice. But perhaps he trusts the State, that headstrong instrument and master, too much.

New Inventions

APPLICATOR FOR PENICILLIN CREAM

A SATISFACTORY method has been devised for the introduction of penicillin cream into the depths of small abscesses of the fingers. The cream is contained in a piece of glass tubing about 5 cm. long and 5 mm. in internal diameter. One end of the tube is plugged with cotton-wool, and the cream is expelled from the tube by pushing on the cotton-wool with an ordinary wooden swab-stick. The open end of the tube should be slightly turned in, by holding it in a flame for a few seconds, so that the cotton-wool plug cannot be pushed into the wound. It is convenient to put up each tube with one wooden stick in a wide-mouthed 1-oz. screw-capped bottle.



Tube and stick contained in bottle.

The bottle, containing the glass tube, plugged at one end, and the stick, is autoclaved; the penicillin cream (or 'Penagar' if preferred) is introduced into the tube, lying flat in the bottle, from a serum syringe fitted with a wide-bore aspiration needle. When 'Lanette wax' creams are used, it is best to have the cream base dispensed and sterilised in the barrel of the syringe and to mix the penicillin solution with it in the barrel. Penagar is sufficiently fluid to be sucked up into a syringe after mixing in a bottle. It is important to store the tubes in a horizontal position, as otherwise the cream tends to run out; with penagar it is particularly important to keep the tube horizontal until the agar has set.

For use, the tube and stick are tipped out into a sterile dish; the open end of the tube is inserted into the wound, and the cream is expelled by pushing with the stick on the cotton-wool plug at the other end.

The advantages of the method are: (1) the cream can be introduced into the depths of the wound; (2) the dosage can be easily controlled; one tube holds about 0·5 c.cm. of cream, but more than one can be used for large abscesses; (3) there is no risk of contamination of the cream, as is liable to happen if more than one dose is taken from a container; and (4) there is very little waste.

R. E. O. WILLIAMS, MD, B SC LOND.

Medical Research Council Wound Infection Unit,
Birmingham Accident Hospital.

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THE LANCET

LONDON: SATURDAY, SEPTEMBER 8, 1945

Necessary Action Please

WE appreciate and respect the determination of the Service medical departments not to risk any failure in meeting their commitments, which are still immense. During the war they have cared for the troops with unprecedented success; and they must not be deprived of the means of continuing that success in the critical months or years ahead. They can fairly be asked, however, to take account of the needs of the other eight-ninths of the British population, and to make all possible economies in the use of medical man-power—a commodity which has become painfully scarce at home. Civilians are no doubt liable to exaggerate the difference made by the end of the fighting; but this difference can scarcely be negligible. We have therefore read with astonishment the Air Ministry's statement [1] that its scheme for demobilising doctors is based on preserving the same establishment as during the war—approximately 2·3 medical officers for every 1000 of other personnel. No doctor outside the Royal Air Force—and few perhaps inside it—will readily believe that the end of the war does not permit some reduction in this ratio; and for our part we cannot ignore the letters we receive from RAF officers who are sure that their work could satisfactorily be concentrated into fewer hands. Similarly the many letters from Naval medical officers published in the medical and lay press leave no doubt that a review of Naval shore establishments would show a surplus above current requirements; while (as a correspondent this week remarks) the time has also come when the number of doctors needed in ships should be reconsidered. Rumour has it that in 1939 the Admiralty thought it unnecessary, in time of war, to put a medical officer in each destroyer; so perhaps they can now be persuaded that it is unnecessary to do so in time of relative peace. The Army, though for obvious reasons it cannot ensure all its medical officers a hard day's work, promised some time ago to make the economies of man-power which it regarded as feasible at the end of hostilities [2]; and that is perhaps one reason why we have received fewer letters from the Army than from the smaller Naval and Air Force medical services.

Various announcements have lately been made. The Navy said on Aug. 29 that by the end of the year the main body of officers should have been released up to group 17, but "the engineer, supply, and medical branches will probably still lag considerably behind." The RAF is releasing aircrew officers of group 22 by Oct. 31, but release of doctors in group 18 will not be complete till Dec. 31. Thus in these two Services the plan is to release medical officers later than the corresponding group of combatant officers in general; and in favour of this policy there is, of course, an important argument. Medical officers on the average are older than other officers; which means that a larger proportion of them fall into the early age-and-service groups; which means again that their release at the same time as combatant officers of their group would reduce the ratio of doctors to total strength. Against this argument, however, two others may be advanced. The first, which we have already considered, is that the war-time ratio of doctors to total strength can be reduced now that fighting is over. The second is that medical officers, unlike most other types of skilled personnel, can be quickly replaced—especially in peace-time—by calling up civilian doctors, who require but little training before they can undertake the same duties. It is the knowledge, or belief, that establishments could safely be reduced, and that replacements could be effected, that accounts for the bitterness evident among medical officers of long service whose release has been postponed beyond that of combatant officers in the same group. Here is an extract from a typical letter:

> "The neurosis in Service doctors is appalling: wherever two or three are gathered together the subject is invariably the same, and no-one tires of it. I think nobody, from the highest to the lowest, believes that delay is necessary, because they all know men at home who could be called up."

We have every sympathy with doctors in this country who have done the work to which they were assigned—often seeing somewhat active service in the process—and now, when the war is over and the flags are coming down, are drafted for an indefinite period overseas. Often this will be a grave hardship. But we are equally certain that the doctors who have spent several years in the Forces, and especially those who have served long abroad, should, so far as may be necessary, be replaced by others who have not yet shared the burden of absence from home. By making a colleague feel that he has been fairly treated, and by allowing him to regain contact with his proper work, the new recruit to the Forces will be doing something of lasting value, not only to an unknown individual but to the profession as a whole. Nothing would do more to restore the morale of doctors now abroad than the announcement that since VE-day a substantial number of civilians have been taken into each Service for their relief.

This week brings the good news that the Army has decided to release medical officers up to group 23 by Jan. 20, 1946—i.e., at the same time as combatant officers in general. This decision is most welcome. It must be recognised, however, that the release of groups up to 23 does not carry demobilisation very far: it does not, for instance, affect the young "militiamen" conscripted before the war, who have already served more than six years. In view of the obvious need to raise production, for the export trade as well as for reconstruction, there will be further pressure on the Government to expedite procedure; and we are glad to hear of the Army's intention that any faster rate of demobilisation decided on shall if possible apply to doctors too. This is necessary to maintain the medical profession in a healthy state: first because it will reduce those grievances which flourish especially in foreign soil; and secondly because every month that passes lessens the efficiency of the many young men and women who went away before they had put into practice, and so consolidated, the technical knowledge so expensively acquired at school and hospital.

1. *Lancet*, Sept. 1, p. 281. 2. *Ibid*, 1945, i, 725.

These primarily professional requirements could, of course, be largely met by civilian replacement of Service doctors on a wide scale; and if the war had continued this would have been the only way. Now that military operations have ceased, however, the main emphasis should change to release by means of economies in Service medical establishments, which equity and expediency alike demand for the sake of the civilian population. The ratio of civilian doctors to total civilian strength is, we are told,[3] about 0·7 per 1000; which is wholly insufficient for the tasks ahead.

At the end of this war we have to reverse the saying of the younger PITT: England, having saved Europe by her example, must now save herself by her exertions. The nation has never had more immediate need of good doctors and plenty of them.

Scrub-Typhus Vaccine

DETAILS of the vaccine against scrub typhus[4] are no longer a military secret, and we can now give a few particulars of general interest. Attempts to prepare an egg-culture vaccine against scrub typhus have not so far attained success, although this method has given us a useful vaccine against epidemic and murine typhus. By December, 1943, scrub typhus had established itself as a major factor in military operations in the Far East, and the need for maximum protection of our troops thus became the urgent concern of the medical department of the War Office and the Medical Research Council's typhus committee. It was resolved that, in addition to active measures to apply known methods of prevention,[5] another attempt should be undertaken to prepare a successful vaccine. This was not a decision to be made lightly, for previous experience with scrub-typhus rickettsiæ (*R. orientalis*) had established that risks of fatal laboratory infection were both real and hard to control; but the work was begun at Hampstead in the National Institute of Medical Research. In a few months it had been found that rickettsiæ could be harvested in abundance from the lungs of cotton-rats infected by the intranasal route. Thus a big advance had been made, for it seemed that previous attempts to prepare a successful scrub-typhus vaccine had failed because of insufficient yields of rickettsiæ. Accordingly a vaccine of killed rickettsiæ was prepared from the lungs of cotton-rats dead of the disease. The vaccine was next used to immunise mice, which were later inoculated with virulent scrub-typhus strains. In these animal tests the vaccine showed sufficient protective power to justify its trial in the human subject. Manufacture on a small scale was pushed ahead to produce enough vaccine for a small field trial in the Far East, since it was soon established that the vaccine caused no ill effects in man. As with ordinary typhus vaccine, three doses of 1 c.cm. were given at intervals of one week; further doses of 1 c.cm. were advised at yearly, 6-monthly, or even shorter intervals according to the risks of exposure. In the field, Army and MRC workers met and considered the scrub-typhus problem again in the light of laboratory results with the new vaccine. Because of operational plans it was clear that large-scale production could not await the results of a small field trial if the vaccine was to be a material factor in the important campaigns ahead. It was resolved, therefore, that the results in laboratory animals justified preparation of vaccine on a big enough scale to achieve two objects simultaneously—a field trial on a large scale, and immunisation of as many as possible of the men who would be engaged in operations in scrub-typhus areas.

The field workers put this view to the War Office about the end of 1944. By this time it was a case of acting first and talking afterwards, if the vaccine was to be ready in time for the projected campaigns. Accordingly the War Office directorate of pathology, whose duty it is to advise on all matters of immunisation within the Army, took the initiative after hurried preliminary consultations. As a result, the buildings necessary for the vaccine were erected and ready for work by the end of April, 1945, and the whole project was allocated an operational priority. The way was thus cleared without delay for the large-scale manufacture of this difficult vaccine.

The operation that followed was notable for two things usually considered incompatible—a large number of collaborating parties, and remarkable speed in achieving results. Those most closely concerned were the War Office, the Medical Research Council, the Ministry of Supply, the Wellcome Foundation Ltd., and the Air Ministry who had the responsibility for flying very important but extremely difficult passengers—the cotton-rats—from America to this country. The staff who made the vaccine were volunteers fully informed of the risks they ran; they included doctors and laymen, Army medical officers, research-workers of high repute, soldiers, and women of the ATS. Since the beginning of this year they have had only one object: to prepare the vaccine.

This is by no means the whole story, whose details require leisure for telling and the mention of many individuals by name; but it is an outline of the events behind the "secret vaccine" which has aroused so much interest and demanded so many efforts from so many people. As a result of these efforts, some thousands of the men even now about to enter the areas of greatest risk—happily not on operational duties—have been immunised; and the results will be awaited with the greatest interest.

3. *Lancet*, Sept. 1, p. 287. 4. *Ibid*, 1945, 1, 310.
5. *Daily Mail*, August 27, 1945.

Vitamin-B Deficiency and Nervous Disease

DURING the last fifteen years it has become abundantly clear that beriberi is not the only form of nervous disease caused by vitamin deficiency. The pioneer work of EIJKMANN had revealed a close connexion between the ingestion of polished rice and the development of avian polyneuritis; hence the early name for vitamin B—the "antineuritic vitamin." The synthesis of thiamine by WILLIAMS in 1936 was immediately followed by the researches of the Oxford school into the mechanism of its action. R. A. PETERS and his colleagues gave a brilliant and convincing demonstration of the biochemical lesion in pigeons suffering from acute thiamine deficiency. They showed that thiamine is a catalyst in whose absence sugar metabolism in the pigeon's brain is disturbed, with resulting accumulation of the intermediary metabolite pyruvic acid. Next came the demonstration of pyruvate in the blood of vitamin-deficient birds and in the blood and cerebrospinal

fluid of Chinese beriberi patients. This work suggested that a failure to develop the full energy of carbohydrate, in the absence of thiamine, was sufficient to interfere with the function of certain groups of nerve cells. These laboratory investigations were succeeded by clinical observations in all parts of the world, and the value of thiamine in the acute manifestations of beriberi has been proved beyond a peradventure. However, doubt remains about the way it works in the more chronic forms of beriberi or nutritional polyneuritis, in which—possibly because of irreversible cellular changes—its action has been less spectacular.

The novel conception of a biochemical rather than a histologically demonstrable lesion in this particular form of vitamin deficiency has borne fruit in clinical medicine, and we can now readily explain the occasional occurrence of polyneuritis in the acute fevers, during pregnancy, and in thyrotoxicosis. The increased basal metabolic rate in all these conditions increases the body's demand for thiamine, and if an excess of carbohydrate is given without a concurrent increase in the thiamine intake polyneuritis may follow. The same considerations apply to so-called alcoholic neuritis and alcohol-tobacco amblyopia, in which excellent results have been obtained with thiamine. That the remedy is often more effective when given intravenously is probably due to impairment of the absorptive capacity of the intestinal mucosa by long-continued thiamine deficiency.

With the synthesis of thiamine the whole B complex began to disintegrate. This process, now happily on the way to completion, was accelerated by ELVEHJEM's discovery in 1937 that extracts containing nicotinic acid cured canine black-tongue, a disease which appears to be the counterpart of human pellagra. Clinical trials of the substance in human pellagra gave striking results, for the lesions of skin and mucous membrane cleared up with amazing rapidity, though the mental and nervous symptoms responded more slowly. With the focusing of attention on pellagra which has accompanied this therapeutic advance, it has become clear that some of the signs and symptoms formerly described as pellagrous belong in fact to another syndrome which is now emerging from the pellagrous fog.

This syndrome, which when full blown is characterised by a rapidly developing amblyopia (usually with central scotomas), cheilitis, glossitis, scrotal eczema, reflex changes, and involvement of cranial nerves, was first described by FITZGERALD MOORE [1] in 1930 in Nigerian school-children. His later investigations confirmed his original view that the condition was due to a vitamin deficiency and was curable by yeast and 'Marmite.' In 1935 LANDOR and PALLISTER [2] reported a similar syndrome in Malayan prisoners; they put this down to a vitamin-B_2 deficiency but thought it possible that two separate diseases were concerned. SEBRELL and BUTLER [3] in 1938 pointed out that the cheilitis or angular stomatitis hitherto considered pellagrous was in fact amenable to treatment with riboflavine, and they coined the name "ariboflavinosis" for this deficiency condition. Subsequent observations have shown that a superficial vascularising keratitis and dimness of vision are also symptoms of the condition, which often occurs in conjunction with pellagra. STANNUS,[4] in his 1944 Lumleian lectures, ascribes the syndrome to a "hypo-riboflavinosis," and suggests that riboflavine deficiency produces a capillary dysergia which is ultimately responsible for the symptoms. In Hong-Kong before the Japanese occupation, at a time when unemployment and consequent malnutrition were rife, WILKINSON and KING [5] observed 15 cases of progressive dimness of vision, with contraction of the visual fields but without central scotomas, accompanied by sore tongue, giddiness, palpitations, acroparæsthesiæ, and weakness of the limbs, sometimes with scrotal eczema and œdema of ankles and eyelids. Visual defects in these cases responded slowly to yeast but much more rapidly to either nicotinic acid or riboflavine; so it seems that the amblyopia arose from a lack of nicotinic acid, riboflavine, or both. It may be significant, however, that the diet of the patients was strikingly low in protein, and the only "meat" they got was salt fish.

In our last issue SPILLANE and SCOTT reported a similar syndrome in 112 German prisoners-of-war in the Near East. The men had suffered previous deprivations and hardship, and diarrhœal diseases were common in the camps. The illness usually began with failing vision due to a retrobulbar neuritis, and this was followed by tinnitus, progressive nerve deafness, and an ataxic paraplegia. Abductor laryngeal palsy was noted in 3 cases, and mild optic atrophy was found in 40% of the men who had been ill for a year or more. Response to treatment based on a deficiency ætiology was disappointing and slow, and a further perplexing point was the failure of a large number of men at similar risk to develop the syndrome. This, of course, may have been due to the absence of some conditioning factor, such as an antecedent achlorhydria, in those who escaped; for we know how important the presence of such factors may be in the genesis of beriberi and pellagra. Individual variations in the efficiency of bacterial synthesis in the colon must also be taken into consideration, and recent work suggests that a diet low in protein, by discouraging the coliform bacteria which are the main synthesisers of B vitamins in the gut, plays a part in precipitating vitamin-B deficiencies. The poor and slow response to treatment has its analogue in the indifferent response of chronic beriberi to thiamine and of the nervous signs of pellagra to nicotinic acid. Despite the comparative failure of therapy the evidence suggests that this neuropathy was a manifestation of riboflavine deficiency.

We may hear more of this clinical picture when detailed reports come through from the medical teams which have gone out to the liberated Japanese prisoner-of-war camps, for a large proportion of the internees at five Japanese internment camps in the Philippines, from which some repatriated doctors brought information last year, suffered from progressive lassitude and blurring of vision, with

1. Moore, D. F. *W. Afr. med. J.* 1930, **3**, 46; *Lancet*, 1937, i, 1225.
2. Landor, J. V., Pallister, R. A. *Trans. R. Soc. trop. Med. Hyg.* 1935, **29**, 121.
3. Sebrell, W. H., Butler, R. E. *Publ. Hlth. Rep. Wash.* 1938, **53**, 2282.
4. Stannus, H. S. *Brit. med. J.* 1944, ii, 103, 140.
5. Wilkinson, P. B., King, A. *Lancet*, 1944, i, 528.

peripheral paræsthesiæ and loss of sensation.[6] As in the cases reported by SPILLANE and SCOTT, contraction of the visual fields and central scotomas were the usual findings; and in our correspondence columns this week Major SPILLANE, who has now examined 23 men from camps in the Far East, notes a striking resemblance between their condition and that of the Germans as described in his paper.

Annotations

THE NEW PHYSIC

THE problem of the regius chair of physic at Cambridge has been happily solved by the appointment of Sir Lionel Whitby, on his return from the Army. The choice is notable not only for its own sake but as an innovation. The new regius professor is not a physician in the ordinary sense, but a clinical pathologist; and his chief interests have lain in bacteriology, hæmatology, and experimental chemotherapy. If there should still be anyone inclined to place the clinical pathologist on a lower level than his colleagues with beds, he will doubtless note this sign of the times. From a more practical standpoint, the chair offers interesting opportunities to a man of 50, and we may hope for valuable developments at Cambridge in the coming years. Next month Dr. R. A. McCance officially takes up his duties as professor of experimental medicine, in which he will use the clinical facilities of Addenbrooke's Hospital; and the regius professor will similarly have access to the hospital's resources in pathology. We shall be disappointed if the future does not show, among other things, a school of chemotherapy founded in the favourable neighbourhood of Cambridge's other scientific departments.

HÆMOGLOBIN IN MOTHERS AND OTHER WORKERS

THE Medical Research Council's latest report,[7] on "Hæmoglobin Levels in Great Britain in 1943," is not likely to be a best-seller. The text is mostly technical and the tables of figures are numerous and statistical; but the technical sections dealing with standards go into minute detail and will be of great importance for any future similar surveys, and many matters of general interest are embedded in the text and tables. The Haldane-Gowers hæmoglobinometer was used, since it is simple, cheap, and portable, and instruments were available calibrated to the specification of the British Standards Institution. Precautions were taken to get the maximum uniformity from the 60 or so observers who took part in the survey. The main defect of the method was found to be personal variation; some observers have persistent large individual errors, which could perhaps be obviated by using photoelectric instruments, but a simpler method is just not to employ "error-prone" observers.

The average hæmoglobin level for males between 20 and 49 years of age was 103·2% for single men, 102·5% for married; for single females between 30 and 49 the figure was 93·5%, and for married, 91·5%. These figures are satisfactory for a population in the fourth year of war under strict rationing. But division into occupational groups shows very interesting variations, and the picture then is not so good. In men, single civil servants and Scotland Yard police (who reach 111·8% with none below 90%) have the best showing, and single textile workers (average 96·2% with a fifth of the total below 90% Hb.) the worst. Among married women, lower-grade civil servants have the best figures (97·5% with one in every twenty-five below 80% Hb.) —apparently higher-grade civil servants do not marry. Textile workers are next to the lowest with a mean Hb. of 85·5% and one in five below 80% Hb.; housewives, a large group, average 91·5% Hb. with one in ten under 80% Hb. Housewives are better off than non-metal factory workers, locomotive and carriage workers, students, and domestic workers, about level with nurses, and worse off than all other groups including teachers and metal factory workers.

The causes of these differences are not clear, but one obvious factor is that some can get an extra meal in canteen or restaurant and others, especially housewives, cannot. The survey went into this, and the results, surprisingly enough, show no significant difference within each occupational group between those who do and those who do not supplement their rations in this way. The committee note a "small but consistent decline" in hæmoglobin with increasing number of pregnancies, and suggest that the needs of parous women for hæmopoietic factors are not being fully met; and although they have not found any serious degree of anæmia, there are too many married women in all occupational groups with hæmoglobin below 80%. This finding is the most striking of the survey. Apart from commenting that women with families are not getting a proper quota of blood-forming foods, the committee do not hazard an explanation; but there is another factor, well known to every GP and father of young children, which illustrates the way imponderable social factors influence surveys of this type. This factor is that the children's ration, and particularly the meat ration, is inadequate; so Mother makes it up by sacrificing some of her and Father's rations, and since Mother's ration is barely sufficient for her larger needs she feels the deficiency most; it is noteworthy that the tables show perceptibly lower hæmoglobin levels for most fathers as well. In the early part of the war, it was undoubtedly right that the worker's health should come first, and this survey shows that, with the notable exception of the textile industry, the hæmoglobin level of the workers has been kept up. But now there is surely no longer any justification for sacrificing the mothers to the workers, and we hope that this survey will influence Sir Ben Smith to apply increased supplies, when they eventually arrive, to raising the meat ration of all children, including the youngest, to adult level, and giving the children priority over other claimants.

The case of the textile workers is curious; the survey does not show where the tests were done, whether in London or in the traditional homes of textile workers in West and North; is it due to some odd social habit connected with feeding, or is it the nature of the work? Here is something for the newly-appointed professors of industrial medicine to investigate. Some of the credit for the good hæmoglobin level of the population has been assigned to the national loaf, which is estimated to have added 2 mg. of iron per day to everyone's ration (about 16 mg. a day is needed according to this committee), and the present reduction of the "percentage extraction" of the flour for the national loaf is being criticised because the iron ration of the population is thus being reduced. Unfortunately it is not clear how far the increased iron is fully available.

In many ways this survey is incomplete, as its authors freely recognise, but it will be of great value for comparison. In future surveys much more information on the social side will, it is hoped, be available; observations should be extended to other factors of importance in keeping up the hæmoglobin level, such as serum proteins, on which a beginning has been made in this survey. The methods have been adequately standardised by thorough groundwork, so all is ready when other workers begin.

6. Adolph, W. H., Greaves, A. V., Lawney, J. C., Robinson, H. L. *War Med.* 1944, **5**, 349.
7. *Spec. Rep. Ser. med. Res. Coun., Lond.* No. 252. 1945. HMSO. Pp. 128, 2s.

MEDICAL RESEARCH IN THE COLONIES

Now that peace has officially been restored in most parts of the world, it is possible to give thought to the needs of our Colonial Empire for research of many different kinds. Even in the dark days of the war, however, these needs were not forgotten. In 1940 the Government of this country made a sum of up to £500,000 a year available for research in or for the Colonies; and under the Colonial Development and Welfare Bill of 1945 this provision was raised to £1,000,000 per year. During the war years the personnel and resources free to carry out such research were both severely limited, and even during the early post-war period men will be scarcer than money. Nevertheless even during the war some work was possible, and the results for 1944–45 are recorded in the second annual report of the Colonial Research Committee.[1] The range is wide—from the social sciences to Colonial products and geology—but here we are chiefly concerned with the medical aspect.

The Colonial Research Committee has promoted the formation of specialist committees which will foster research in their own special fields; and in accordance with its policy a Colonial Medical Research Committee (with Sir Edward Mellanby, FRS, as chairman) was set up in conjunction with the Medical Research Council as we have already noted.[2] This committee has held two meetings to date and has taken preliminary steps to inform research-workers in the medical and allied sciences (including entomology, helminthology, and physiology) about the openings which will be made for research in these departments[3]; but the projects described in the report now published were planned and begun before the Colonial Medical Research Committee started.

Among those sanctioned during 1944–45, the imagination is most stirred by the preliminary investigations made on the control of mosquitoes and other disease-carrying insects by the new insecticide DDT. Mr. C. B. Symes and Mr. A. B. Hadaway, under rather difficult conditions, performed some striking experiments in British Guiana, and showed that under suitable conditions the mosquito population in houses can be almost completely annihilated by this means and that the number of larvæ in the breeding-grounds can be greatly diminished. There are suggestions that many of the other insects which make life in the tropics unsafe or unpleasant may be successfully attacked by the same agent. But the technical difficulties involved in the effective and economical distribution of this insecticide are very complex, and its accurate evaluation will require many years' team-work by chemists, engineers, entomologists, and other scientists. Moreover the destruction of insect pests must not include in a common massacre the simultaneous destruction of pollen-bearing bees and other arthropod friends. Clearly years of many-sided research lie ahead before the dream of tropics free from noxious insects can be realised.

Research has also been sponsored on the habits and breeding-grounds of *Anopheles gambiæ* in West Africa, particularly as they concern the recently appreciated *melas* variety. This is work which is less intelligible to the non-entomologist than the study of DDT, but it will greatly improve the health of our great ports and naval bases at Freetown and Lagos. Support has also been given to far-reaching schemes for cinchona research and development in East Africa, so that the Empire will no longer depend upon Java as its main source of quinine. In addition, initial steps have been taken to study the nutrition of the native populations in many of the Colonies. Considering what has been accomplished under the severe strain which the war has imposed on all alike, the record of this report is encouraging.

1. Colonial Research 1944–45. HM Stationery Office. Cmd 6663. 6*d*.
2. *Lancet*, 1945, 1, 442.
3. Further information about the scientific scope of such research may be obtained from the secretary of the Colonial Medical Research Committee, National Institute for Medical Research, London, NW3, and about pay and conditions of service from the Director of Colonial Recruitment (Colonial Service), 15, Victoria Street, London, SW1.

NON-OFFICIAL REMEDY

AN essay in heterodoxy—even a heterodoxy that seems extreme and unpractical—is bound to be arresting. Besides, Dr. Scott Williamson can claim to have justified already, at Peckham, many of his earlier unorthodox and seemingly impracticable ideas. In his new book[1] he puts his finger on deficiencies of present-day medical practice; but when he comes to suggest remedies he slips too easily into generalisations. It is easy to agree that diagnosis is highly important, and that the future general practitioner must be better equipped to make accurate examinations; and clearly much of the necessary diagnostic apparatus need not be the sole property of the practitioner; it would be better shared by a team working from a clinical centre. But when Dr. Williamson insists that no diagnosis must be made except at the clinical centre, and that all patients must be brought there for their first consultation, no matter what their presenting symptoms or clinical condition, it is hard to share his ardour. Again, most people would agree that domestic help should be available for every partially or wholly incapacitated housekepeer; but few would accept his suggestion that if the housewife needs hospital care, her home should be closed and her husband and children should be sent willy-nilly to a municipal hostel staffed by domestic-science trainees from the local young people's college. The Peckham experiment should have taught Dr. Williamson more about British families than that.

He thinks the Government should collect the cost of the new service roughly on an income-tax basis, with the largest contributions coming from those with the highest incomes and the fewest dependants. Part of the money so collected would be paid to local lay committees, who would directly provide and administer the clinical centres, from which all practice will be carried out, and also, indirectly, the hospitals. The committees would be autonomous, elected for their purpose by the residents of the area most conveniently served by their particular clinical centre—an area quite independent of local-government boundaries. Each committee would be made up of equal numbers of men and women, all of whom must be parents. Parenthood, this seems to imply, is the hallmark of the administrator. He thinks there should be no lack of suitable candidates for "there will always be grateful patients anxious to see the good work of which they have had experience furthered, and ungrateful patients anxious to see the bad work from which they may have suffered, eliminated. That is why the voluntary hospitals have been good and progressive": but surely it is rare for a voluntary hospital to admit a satisfied (let alone a dissatisfied) patient to its board? Individual doctors would be paid from a generous central fund, derived from the Treasury but administered by the medical profession. And payments would be made per item of service—though our past experience of schemes paying in this way ought to be sufficient warning.

Dr. Williamson's thought-provoking views cover a range wide enough to include environmental and social medicine, medical education, the rôle and training of the consultant, industrial medicine, the function of the hospital, and the preponderating importance of the general practitioner. But they never encompass the realities of our present situation, and they are too nebulous to afford an immediate basis for the building of a national health service.

1. Physician, Heal Thyself: a Study of Needs and Means. G. Scott Williamson, MC, MD EDIN. (Faber and Faber. Pp. 133. 5*s*.)

DOMESTIC STAFF IN HOSPITAL

MANY senior nurses believe that shortage of domestic staff is largely to blame for the high wastage of student nurses during the early years of training. In some hospitals nurses not only do much of the ward cleaning, but are obliged to keep their own rooms clean as well; and in others, nurses have had to undertake some of the cooking and washing-up because the kitchen staff cannot cope with it. Girls who have come to hospital to learn nursing resent this misuse of their time, especially when there are scarcely enough of them to get through their own job. A recent estimate based on reports from both matrons and nurses at reasonably well-staffed hospitals shows that the nurse often spends as little as 4–5 hours a day in actual nursing of patients, the rest of her 9–10 hours of duty being occupied in cleaning, mending, secretarial work, and errand-running. Lack of domestic staff is particularly acute nowadays, when large numbers of women are still working in factories; but even before the war matrons found it hard to get enough maids, so that the early release of women from industry, though it may be expected to ease things, is not likely to end the difficulty.

It is often suggested that civilian, like Service, hospitals should use orderlies; and, indeed, the London County Council already employs hospital orderlies with success. Only women are engaged, and their status and salary are intermediate between those of the nursing and the domestic staff. They wear a distinctive uniform, and two of them serve each ward unit, dividing the time from 7.30 AM to 8.30 PM between them in such a way as to give each a 96-hour fortnight. Every unit is served, in addition, by two ward-maids who do the rough work. The orderlies are responsible for the lighter domestic tasks—dusting, cleaning, and polishing furniture and equipment, including patients' lockers, electric-light fittings, tiles, and trolleys. They also clean the ward annexes, look after fires, cut bread-and-butter, help to serve and clear meals, and if necessary to wash up. They do not ordinarily attend on patients, though in hospitals for the chronic sick and in convalescent homes they may be asked to give bedpans or to help when patients are being blanket-bathed, washed, or fed. The Council have found their orderly service useful in relieving the student nurse of irrelevant domestic work; if the hospitals for chronic sick become training-schools for assistant nurses the scheme will be overhauled to ensure that there is no danger of orderlies becoming a third grade of nurse.

Miss J. Eyre, SRN.,[1] in a comprehensive proposal, has suggested that a National Auxiliary Service for Hospitals (NASH) should be founded under the Ministry of Labour to supply trained hospital orderlies, both men and women, recruited from among those who have been doing similar work in the Services; and to train civilians willing to do this work. This recalls the proposal of Miss Violet Markham and Miss Florence Hancock[2] that a National Institute of Housekeepers should be founded to train women for domestic service. Hospital work naturally differs considerably from work in the home, but deserves at least equal encouragement. It is as important in its own way as good medicine, surgery, nursing, and catering; but how often is the ward-maid aware of this, or encouraged to take pride in it?

Before the war the matron at the Cheshire Joint Sanatorium established a housekeeping course for her domestic staff. They were given an attractive uniform and trained for a period in each of the various departments of the hospital. At the end of the course they received the title of "assistant housekeeper" with an appropriate rise in pay and a certificate of proficiency. The scheme promised to attract keen and capable workers, but unfortunately lapsed when the matron moved elsewhere. Its success thus seems to have depended in part on personal influence rather than on the merits of the scheme itself; but, failing any larger scheme, other experiments on the same lines would be worth trying, and would probably contribute something of permanent value to the pattern of hospital staffing. It should be possible for every hospital training nurses to have also its own school of housekeeping.

These, however, are long-term suggestions. To meet the immediate need for domestic staff various expedients are being tried. Young Belgian women have been invited to come and work for a while in London voluntary and LCC hospitals, and so far some 500 have arrived. They are reported to be splendid workers; and the fact that many of them speak nothing but Flemish is a stimulus to the ingenuity of the English staff. At Guy's Hospital women prisoners from Holloway have been allowed to come as scrubbers; they work together under the supervision of their own warders, and are said to do the job well. This experiment is interesting, since it may prove a step in prison reform; these women must surely benefit from sharing in work of social value. An objection, of course, is that the status of domestic workers will not be raised by giving the occupation a link, however tenuous, with our penal system; but the advantages may be great enough to outweigh this disadvantage. Another short-term measure might be to employ women from colonies of mental defectives. Many of these work well under supervision, and they would find great pleasure in the change of scene.

1. *Lancet*, June 23, p. 802.
2. Post-war Organisation of Private Domestic Employment, Cmd 6650, HM Stationery Office, 6*d*.; and see *Lancet*, June 23, p. 793.

PERMANENT APPOINTMENTS

LAST week we published an advertisement for the post of deputy medical superintendent at the Somerset and Bath Mental Hospital, Cotford, which invited applications by Sept. 21. We published it on a verbal understanding that the appointment was not to be permanent but belonged to category B1 under the EMS scheme. The hospital committee has however sent the same advertisement to the *Times* without this proviso, and has not responded satisfactorily to our request for written confirmation that the post will be temporary.

We take this opportunity of saying that we are no longer prepared to publish advertisements for permanent medical appointments which do not give at least four months' notice so as to allow application by possible candidates serving in the Far East. If a senior post has to be filled within four months any appointment made should in our view be temporary, and the vacancy should again be advertised when doctors now in the Services are able to compete for it on equal terms. The full policy we should like to see adopted was set out in our leading article of July 28.

The council of the British Medical Association on July 24 directed that "advertisements of permanent medical appointments which do not invite applications from practitioners serving in HM Forces and allow at least four months for the receipt of applications be refused publication in the *British Medical Journal* and that the reasons for such refusal be explained to the employing authorities concerned."[1] Explanation has not so far induced the Cotford Mental Hospital committee to revise its plans, and its appointments are therefore the subject of a warning notice from the Secretary of the BMA, asking possible candidates to communicate with him before sending in any application. We trust that other authorities will better appreciate the urgent need to avoid unfairness to candidates whose war service has temporarily taken them far away.

The death is announced on Sept. 2 of Dr. JAMES THOMAS WILSON, FRS, emeritus professor of anatomy in the University of Cambridge, aged 84.

1. *Brit. med. J.* Aug. 11 (Suppl. p. 39).

Special Articles

MEDICAL ASPECTS OF BELSEN CONCENTRATION CAMP

F. M. LIPSCOMB, F R C P
LIEUT.-COLONEL RAMC

BELSEN Concentration Camp, the character of which was previously unknown, was taken over by the British Army on April 15, 1945, under a local truce amid the fighting in the last phase of the campaign in north-west Germany, and medical units began to arrive there on April 17. The appalling conditions found and the general administrative measures taken to deal with the situation have been described in THE LANCET (1945) and by Collis (1945); Janet Vaughan (1945) contributed observations on the treatment of starvation there to a discussion at the Royal Society of Medicine; and realistic accounts of certain aspects of the work have been related by Hankinson (1945), Dixey (1945), MacAuslan (1945), and Gibson (1945). Specialists in various branches of medicine also have made detailed studies in their proper spheres and will present their findings in due course.[1] The purpose of the following notes is to record a general survey of the diseases met with, the schemes of management and treatment, and some of the lessons learned as a background for detailed reports on special aspects.

The concentration camp comprised two portions—Camp I, which came to be known as "The Horror Camp," housing about 22,000 females, 500 children, and 18,000 males in huts; and Camp II, containing about 17,000 males in brick buildings. Russians and Poles predominated. Czechs, Belgians, French, Italians, and Yugoslavs were also present. The great majority were Jews. The state of the inmates of Camp I was described by the Senior Medical Officer after his first survey as "a dense mass of emaciated, apathetic scarecrows huddled together in wooden huts, in many cases without beds or blankets, in some cases without any clothing whatsoever. The females in worse condition than the men, their clothing, if they have any, only filthy rags. The dead lie all over the camp. . . ." On further investigation many more corpses were found inside the huts among the living who had not the strength even to drag them outside. Some 10,000 dead were lying in the camp when we took over and thousands more died before it could be cleared. Typhus was rampant in Camp I but Camp II was free from it.

Some 70% of the internees in Camp I and 20% in Camp II would ordinarily have been regarded as "hospital cases" but it was impracticable to admit such a vast number to hospital at one time. The policy adopted was that the greatest number of lives would be saved by placing those who had a reasonable chance of survival under conditions in which the natural tendency to recovery would be aided by suitable feeding and prevention of further infection, with rest in bed and elementary nursing for the very sick. To this end it was decided first to evacuate Camp I. The very ill were cleansed in a "human laundry," supplied with clean bedding, and admitted to a hospital area improvised in neighbouring barracks from which the Wehrmacht and Hungarian troops had been removed. A block in this area containing 670 beds was equipped each day and filled with patients the following day. Those fit enough to feed and maintain themselves were cleansed and taken to another part of the barracks. When part of Camp I had been cleared some of the vacant huts were cleaned out and used as a temporary hospital until the patients could be admitted into the main hospital area. This subsidiary hospital was staffed by students from the London medical schools aided by internee nurses.

The hospital area proper was ready to begin admitting patients on April 20, but 24 hours' delay was caused by the Germans cutting the water-supply as a final gesture before they left. By May 18, 13,834 patients had been admitted and the evacuation of Camp I was completed; 1844 of these died after admission, giving an over-all case-mortality in hospital of 13·3%.

1. Dr. A. P. Meiklejohn informs me that collated clinical and pathological reports made by the medical students who worked there under his supervision will be filed in medical reference libraries.

PREVIOUS NUTRITION OF INTERNEES

The diet in concentration camps appears always to have been insufficient. Since January, 1945, however, and probably longer, the majority of internees at Belsen had received about 300 grammes of rye bread and varying amounts of vegetable soup, of which the chief ingredient was a root resembling mangold-wurzel, each day. This gave something under 800 calories. Small quantities of meat were issued from time to time which were absorbed by the kitchen staff and their friends. What each individual actually got depended on his or her ability to fetch it.

No food or water had been provided in the camp for four or five days before our arrival.

PREVALENT DISEASES

Systematic records could not be made, but the relative prevalence of diseases among those taken into hospital was roughly estimated from clinical examination of a cross-section of an unselected batch of admissions checked by subsequent comparison with other batches and bacteriological and radiological examinations when these became available. Figures quoted below, therefore, are estimates and have no pretence to statistical accuracy.

The prevailing morbid conditions were deficiency diseases, typhus, and pulmonary tuberculosis. Diarrhœa was almost universal.

DEFICIENCY DISEASES

The outstanding deficiency was plain *lack of food and water*. More or less malnutrition was evident in practically all patients: in some 60% it amounted to starvation. The emaciation of the corpses in the camp showed that starvation had been almost universal among them also when alive. These cases of starvation were divided by a broad, but not clear-cut, distinction into two groups:

1. The "*dry*" *cases* were characterised by extreme emaciation with lowering of all bodily and mental processes, resulting in prostration, apathy, grossly impaired digestive function, and depressed peripheral circulation. Dehydration was usually a prominent feature. Slight œdema of the feet was often present, but massive œdema was absent.
2. The "*wet*" *cases* had gross hunger œdema in addition to the other symptoms. About 6% had hunger œdema on admission, but many of those originally classified as "dry" developed it later.

Transient pyrexia without obvious infective cause occurred in both groups. Diarrhœa was very common and often aggravated dehydration. It will be mentioned again later.

A small number of observations revealed low plasma proteins, and reduced volume and over-concentration of the blood. These features were not constant, and with the limited facilities for investigations, definite correlation between them and the clinical condition was not established. Anæmia was often present and sometimes severe; it seemed to be more pronounced in the "wet" than the "dry" cases, possibly because, among the latter, it was masked by hæmoconcentration. The colour-index was nearly normal and there was very little scatter in the size of the red cells—that is, there was no evidence of relative deficiency of iron or red-cell-maturation factor.

Cancrum oris was noted in about 0·5% of female admissions: it was not seen in males. It originated in ulcerative gingivitis around stagnation foci associated with dental bridge-work or crowned teeth, and Vincent's organisms were constantly present.

The adverse effect of heat on cases of starvation was remarkable. The prevailing cool weather was interrupted by a few days on which the temperature reached about 95° F in the huts. During this hot spell patients who had improved to the extent of taking solid food and getting about suddenly collapsed.

Clear-cut specific *vitamin-deficiency syndromes* were strikingly absent. Evidence of possible partial deficiencies was as follows:

Vitamin A.—No xerophthalmia was seen: a harsh dry skin with follicular keratosis was often encountered but the

effects of dehydration, exposure, and scratching made its ætiology doubtful.

Thiamine.—A few cases of myocardial insufficiency with warm pink œdema suggested "beriberi heart," but they failed to improve on 100 mg. of thiamine a day. Peripheral neuritis which could not be otherwise explained was not observed.

Riboflavin and nicotinic acid.—Varying degrees and combinations of raw red painful tongue, often with marginal ulcers, "cobblestone" tongue, and angular stomatitis were met with, but no true cheilosis or genital signs: here again the picture was confused by dehydration and infection. Diarrhœa was almost universal, and some patients had suggestive pigmentation, but no example of classical pellagra was seen and cases treated with 300 mg. of nicotinic acid a day did not improve significantly more quickly than those who received the standard daily issue of 3 compound vitamin tablets (thiamine 1 mg., riboflavin 1 mg., nicotinamide 10 mg., and ascorbic acid 25 mg. in each) with their diet.

Ascorbic acid and vitamin D.—No case of scurvy or of clinical rickets came to notice.

Diagnosis.—It was early apparent that diagnosis in these cases of starvation was a problem of great complexity and practical difficulties, rendered no less by the mental state of the patients and lack of interpreters of Central European languages. In any individual case the factors to be assessed included not only the fact of starvation, but also the degree of dehydration; the state of the myocardium and peripheral circulation; the blood-volume; the blood-concentration; the cause of œdema, if present, that is, hypoproteinæmia, cardiac or renal disease, or thiamine deficiency; the influence of infections such as typhus, tuberculosis, or sepsis; the cause of diarrhœa; and, finally, the degree of urgency.

Treatment.—Under the conditions which existed it was obvious that systematic diagnosis and elaborate treatment of individuals, such as might have been carried out in an established general hospital, would take up so much time that only a fraction of them could be dealt with and that to the exclusion of the elementary care of the remainder. The chief duty, therefore, of the majority of medical officers and other workers had to be supervisory, special attention being devoted to individual cases only if it did not interfere with the mass treatment.

Of the four chief measures in the mass treatment—prevention of further infection, rest in bed, nursing, and suitable feeding—the last was that which came specially into the province of the physician.

With long-standing starvation the body had become adapted to low intake of food and water, and the digestive system did not tolerate rapid increase of diet, especially if it contained much fat. Liberal feeding with rich foods, such as were supplied with well-meant but mistaken kindness by fighting units when the camp was first uncovered, or even by injudicious dieting in hospital, caused abdominal pain and vomiting, and precipitated or exacerbated diarrhœa, sometimes with fatal results. The volume of fluid intake also needed to be controlled.

It was found that these subjects of chronic starvation could take food and water by mouth until they were almost moribund if it was fed to them in suitable form, and that intravenous therapy or feeding by œsophageal tube was required by very few—not 5%.

Three stages of diet were devised, the first providing about 800 calories,* the second about 1700, and the third about 3000, all containing a relatively high proportion of protein. The detail of these had often to be changed according to supplies available at the moment: the nutritive values of the final dietaries are summarised in the table. The general scheme was to keep the patient strictly in bed on stage 1 diet for 3 or 4 days, then on stage 2 for a few days, and then on to stage 3, with modifications in special cases if necessary.

* *Stage 1 Diet.*

Milk, skimmed, fresh, or reconstituted from spray-dried powder	2 litres
Sugar	1 to 2 oz.
Salt	½ oz.
Water	1 litre
Compound vitamin tablets (*a*)	3

Flour or oatmeal for thickening, tea or coffee for flavouring the milk, and lemon crystals for the water were issued as extras when available. Anorexia and dislike of sweet things were a well-marked feature in the starvation cases; dry and sharp flavours made feeding easier. Central Europeans preferred to take the sugar separately.

(*a*) Each tablet contains 1 mg. of thiamine, 1 mg. of riboflavin, 10 mg. of nicotinamide, and 25 mg. of ascorbic acid.

SUMMARY OF NUTRITIVE VALUES OF HOSPITAL DIETS

Diet	Stage 1	Stage 2	Stage 3
Calories	817	1755	3099
Vegetable protein (g.)	0·8	28·7	63·7
Animal protein (g.)	64·0	64·2	74·3
Total protein (g.)	64·8	92·9	138·0
Iron (mg.)	2·2	13·9	25·0
Vitamin A (IU)	—	8784†	9084†
Thiamine (mg.)	3·82	4·96	4·08
Riboflavin (mg.)	5·01	5·38	3·20
Nicotinic acid (mg.)	32·1	39·3	30·7
Ascorbic acid (mg.)	105	172†	215†

Alternative foodstuffs are not included: their values approximate to those of the commodities for which they may be substituted.

† If fresh vegetables are not available the values for vitamins A and C are reduced.

It was, however, one thing to plan diet scales and another to ensure that the right food actually reached the internees. In addition to difficulties in obtaining supplies and cooking them, distribution was hampered by the morale of many of the internees having been so lowered by captivity that they would steal the food for themselves or their compatriots outside the hospital, and by the lack of conscience among the ex-enemy personnel who had to be employed. Strict supervision of all stages of supply and distribution by British personnel specially detailed for the job proved to be necessary. The response of even quite severe cases of starvation to this regime was most gratifying.

Protein hydrolysate by mouth was tried instead of skimmed milk for severe cases, but the taste is so nauseating that it was difficult to persuade the patients to take it for more than one day, and it seemed to have little advantage over the milk.

Feeding by gastric or nasal tube, either with skimmed milk or protein hydrolysate mixtures, did not prove a success under the prevailing conditions; with these patients it required as much supervision as intravenous therapy and the fluid was not always absorbed from the gut. Better results might be obtained with a larger staff of skilled nurses.

Intravenous therapy was employed for very severe cases unable to swallow, and to supply amino-acids or protein in cases of hunger œdema. The fluids used were protein hydrolysate in 2·5 or 5% solution with glucose-vitamin fluid by vein or mouth; and plasma or serum, single or double strength, plain or made up with 10% glucose and vitamin solution—if plain, the glucose and vitamin were given by the mouth. Two litres single strength or one litre double strength was given in 24 hours.

The results obtained by different workers were very variable and often seemed to depend more on the clinical acumen of the physician and the nursing facilities than on the precise form of treatment, which is not surprising with cases in which so many factors were involved. At a conference of experienced medical officers who had treated about 220 cases by intravenous methods the general conclusions were:

(1) Feeding by mouth was preferable whenever it could be employed, even if the optimum amount could not be taken to begin with.

(2) The greatest care is necessary to avoid overloading the circulation, even by slow drip, especially when very hypertonic fluids, such as double-strength plasma, are used. It is advisable to go cautiously even with fluids by mouth.

(3) Protein hydrolysate was very little used because a 5% solution often caused phlebitis, and the volume of 2½% solution required to introduce sufficient nitrogen increased œdema and ascites and risked overloading.

(4) Severe "dry" cases of starvation are a bad risk, anyhow, and the mortality is very heavy. There was commonly a complicating infection. The best results from intravenous treatment were obtained among "wet" cases which sometimes responded well to plasma or serum.

Opinion was slightly in favour of double as against single strength. At other times, however, there was no improvement and the reasons for this were not clear.

It was realised that these conclusions were based only on clinical impressions acquired during work among often uncoöperative and mentally deranged patients under conditions of improvisation, and that they might require modification in the light of experience in more favourable circumstances.

A few cases of hunger œdema were treated with salyrgan, bearing in mind that the drug might increase dehydration and does not remedy protein deficiency. Diuresis was promoted but further trial is required to ascertain whether it is really of value.

Cancrum oris responded remarkably well under treatment for the nutritional defect together with surgical toilet, penicillin, and a sulphonamide drug, leaving clean deformities for subsequent plastic surgery.

INFECTIVE DISEASES

Typhus was the major illness in about 25% of the early admissions, and many other patients who were admitted during the incubation period developed it later. It presented no unusual clinical features. Measures for the control of the epidemic were under the direction of a representative of the United States Typhus Control Commission. Operations for delousing the whole population were completed on April 30 and quarantine was lifted on May 21.

The modification of the disease in fully-inoculated persons was exemplified in ten RAMC personnel who contracted it while working in cleansing and delousing operations in the huts. In all these cases the fever lasted 6–8 days only, instead of the usual 14. In all of some 50 uninoculated or partially inoculated well-nourished enemy subjects, who contracted it while employed on similar duties, the fever lasted 14 days. None of the RAMC died and some of the others did, but the difference in these small series was not statistically significant.

Pulmonary tuberculosis in an advanced stage was clinically obvious in about 6% of admissions. Subsequent radiological examination of a cross-section consisting of 331 miscellaneous patients taken in groups at random from various parts of the hospital and unselected except that they were not too ill to be screened showed 6·6% positive, 5·3% probably positive, and 7·7% possibly positive. Assuming that all the probables and half the possibles would eventually prove positive, and adding 4% for the clinical cases too ill to be screened, means an over-all rate of some 20%. The care of these sufferers is a problem for the future.

Autopsies showed active tuberculous disease in the lungs of a very high proportion of cases of starvation.

DIARRHŒA

Almost all internees had diarrhœa at some time or another. It was due to a variety of causes.

About 8% of one series of cases of diarrhœa had clinical evidence of dysentery, and bacteriological examination of other series of cases of diarrhœa was positive in 8% and 15%, the prevailing organism being *B. dysenteriæ* Flexner II. No case of amœbiasis was detected. The infection responded well to sulphaguanidine or sulphathiazole except when complicating severe starvation.

The great majority of cases of diarrhœa appeared to be of nutritional or dietetic origin and most of them cleared up with careful dieting. Medicinal treatment seemed to be useless.

Autopsies often showed extensive ulceration of the large bowel, in one case with perforation. Histological examination of specimens is in progress.

OTHER DISEASES

Sepsis was present in many forms: sores, especially on pressure points, abscesses, and neglected wounds. Infective dermatitis of the impetigo type was surprisingly rare.

Severe *scabies* was found in about 6% of admissions.

Typhoid.—No clinically definite case was discovered. Bacteriological examinations were made in 36 suspected cases: *Bact. typhosum* was isolated from the urine of one but the others were negative.

Relapsing fever was specially sought for. A few cases were seen in which the diagnosis was clinically probable but thorough blood examinations were persistently negative.

Diphtheria.—A few cases were diagnosed clinically and four were confirmed bacteriologically. It was remarkable that a widespread epidemic did not develop.

Malaria and *Cerebrospinal meningitis* were not encountered.

PSYCHIATRIC MANIFESTATIONS

Psychosis, excluding that due to infective toxic causes such as typhus, and psychoneurosis were less in evidence than in an ordinary community of the same size—possibly because only the more extrovert and robust psychological types had survived the ordeal of their captivity.

The most conspicuous psychological abnormality was a degradation of moral standards characterised by increasing selfishness, and it was more or less proportional to the degree of undernutrition. In the first stage consideration for others was limited to personal friends, then the circle contracted to child or parent, and finally only the instinct to survive remained. Emotional response became progressively lowered and consciousness of sex was lost. Eventually all self-respect disappeared and the only interest left was to obtain something which could be eaten, even human flesh. Even among those not grossly under-nourished there was a blunting of sensitivity to scenes of cruelty and death. Children who had grown up in concentration camps were almost unmoved by the sight of these horrors.

Return to normal behaviour as bodily health improved was often surprisingly rapid, leaving only a feeling akin to that of having experienced a bad dream, but the resumption of normal manners was not always accompanied by return of will-power and initiative. Certain individuals who continued to behave in a primitive manner when physical health had returned were discovered to be illiterates who had led a primitive life before internment. Complete rehabilitation is likely to prove a slow business which will need to include productive occupation and education for the young.

I wish to express my thanks to Brigadier H. L. Glyn Hughes, CBE, DSO, MC, Deputy Director of Medical Services, Second Army, for his prompt and effective help in difficulties; to Lieut.-Colonel J. A. D. Johnston, MC, RAMC, Senior Medical Officer, Belsen Camp, for his inspiring leadership and wise advice; and to all those medical men and women who placed their experiences at my disposal.

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INFECTIOUS DISEASE IN ENGLAND AND WALES

WEEK ENDED AUG. 22

Notifications.—The following cases of infectious disease were notified during the week: smallpox, 0; scarlet fever, 1001; whooping-cough, 1152; diphtheria, 409; paratyphoid, 17; typhoid, 12; measles (excluding rubella), 1151; pneumonia (primary or influenzal), 318; puerperal pyrexia, 124; cerebrospinal fever, 47; poliomyelitis, 31; polio-encephalitis, 3; encephalitis lethargica, 2; dysentery, 232; ophthalmia neonatorum, 74. No case of cholera or typhus was notified during the week.

The number of service and civilian sick in the Infectious Hospitals of the London County Council on Aug. 22 was 917. During the previous week the following cases were admitted: scarlet fever, 50; diphtheria, 25; measles, 11; whooping-cough, 18.

Deaths.—In 126 great towns there were no deaths from enteric fever or measles, 2 (0) from scarlet fever, 2 (0) from whooping-cough, 2 (0) from diphtheria, 46 (7) from diarrhœa and enteritis under two years, and 7 (1) from influenza. The figures in parentheses are those for London itself.

Birmingham reports 6 deaths from diarrhœa and enteritis, Brighton 5.

The number of stillbirths notified during the week was 221 (corresponding to a rate of 31 per thousand total births), including 36 in London.

In England Now

A Running Commentary by Peripatetic Correspondents

THREE minds with but a single thought. The first was my companion in a northbound sleeper. "I'm going up to inspect drains," he explained. "Really?" I said, and, noting that he had 2½ rings and that our journey was some 400 miles, I concluded that he must be a person of importance in his line so added, "You must be an expert; do tell me, what does one look for in a drain apart from whether it is blocked or not?" He smiled at my simplicity. "Oh no, I'm not an expert, I'm really a Cheshire GP. This is just an ordinary sanitary round. My SMO doesn't like travelling so I do it. Actually," he went on, "I quite enjoy it. I stay at the Loch Grand Hotel, the food's amazing, almost pre-war, and I usually pick up a bottle or so of Scotch on the trip, so you see it's not so bad." "No, I suppose not," I agreed, "but do they do anything more about your reports when you go so far to write them than they do after you've biked around your station?" "Good Lord, no," he replied; "some of my airmen have been sleeping two in a bed for the past year but I can't get anything done about it. It's better than the job I started on, though, with less than 200 of the Group HQ Unit to look after and paper work which I could have finished in two hours if I had not had to stay at the office till 5.30 every night." "Who's doing that now?" "My SMO. It takes him all day and he loves it." We both laughed and went to sleep.

Twelve hours later I was in another administrator's office. We had discussed an official request of mine and then, surprisingly, got on to a keen clinical conversation. Perhaps I talked more than my share, so I broke off with "But I'm in the way, you must be wanting to get on with the morning's work." "Not at all. There's really nothing to do." The environment was not congenial so I sympathised: "What a bind this job must be." "Oh no, it isn't," he replied, "I'm not ambitious and it suits me very well. You see, I've several hobbies; as a matter of fact I've just finished recataloguing my gramophone records; I've 1500 of them." He passed me two foolscap loose-leaf folders. "Now," he went on more seriously, "I should be inclined to say nothing about that matter of yours we first discussed. I've never seen any good come from following anything up; I've kept this job for two years simply by never saying anything." Perhaps he's a wise man, I thought sadly, as I walked away.

Another six hours later I was receiving a cordial welcome from my ship's surgeon. He was over 60, a grand type. I suppose he knows the world. "So this is your first trip? Well, you've got a good job, and it's worth keeping if you can fix it. Your sick parades 'll not take you more than half an hour, the Captain's inspection, which you'll have to go round on, won't last any longer, and then for the rest of the day *you'll have nothing to do.*"

But of course this was all about a year ago.

* * *

I imagine that one day the War House will remember and release me. I have no wish to deprive any promising young pathologist of the glory, honour, and headaches of a laboratory in the tropics. In my mind's eye I can see him coming, with clear brain and steady hand and a library of those books without which no work can be done. He will have his *Mackie and McCartney*, and, if he is wise, his *T and W*. *Stitt* he must have; I have found *Craig and Faust* invaluable; a laboratory without *Harrison* is a home without a mother. But, before I go, I should like to write yet another to fit alongside them in the shelf (i.e., the box stolen from the Quartermaster). One and all those great and good authors overlook the graver problems.

The moulds that grow in Praed Street have gained some repute, but they are mere cockney pigmies compared with their savage and heroic cousins that sprout, blossom, and seed on my agar while my back is turned. My library has several references to "Moulds—culture of" but none to "Moulds—defeat and extirpation of." (By the way, DON'T put a few drops of chloroform in the tin where you keep the blood agar; it is never the same medium again.) The jackals picked the lock—an explanation not accepted by the Court of Inquiry—of the animal house and bang went the guineapigs. I have no copy of *The Mammals of India*, and no guineapigs either. The local brand of paraffin sealed our 'Primus' stoves beyond repair in one day; where can I get information on the applied chemistry of the higher hydrocarbons? Our still is excellent but in this heat we do not run any stove a moment longer than we must. So with the monsoon in full blast we thought we would collect some aq. dest. from the celestial still. We did and the pH was 8·0 +. (Yes—I know all the explanations and none of them account for it.) A host of affable Bengalis invade the building to mend the windows and fit taps; young man, bring a Bengali dictionary, for they have no Urdu. It may too enable you to put life into the man in the power-house when he decides that the afternoon is too hot to run the dynamos. But most urgently my fortunate successor will need works on formication and formicology; it is unlikely that he will get them bound in one volume. No textbook of the diseases of the skin can make more than tentative (and I am afraid useless) suggestions on the treatment of prickly heat. And nowhere can I learn the art of self-defence against the little red ant. My most precious Petri dishes are his favourite promenade. If I stand the legs of the incubator in water, I have formed no more than a "defensive box"—that is, so long as I can get suitable tins (the lids of May and Baker tablet tins are good for the job) and so long as my serfs remember to replace the water from time to time. But sometimes the tactical situation demands that I leave the plate on the bench for a few minutes. Next morning a circumambulatory track of delicate colonies of *Bact. dysenteriæ* will mark the passage of Man Friday.

I shall be too busy packing to write the book. So let the next man—lucky fellow—bring what he likes but not forget *Tristram Shandy*. I would swap that for the rest.

* * *

Once when I was hobo-ing in Australia—my friend Commander Campbell didn't happen to be with me—I met another hobo whose pride it was that nettles wouldn't sting him. He said he had always been invulnerable to them, and if that was true it is the only case I have come across of a congenital immunity to nettle stings. One can acquire a certain immunity—hedgers and ditchers do on the forearm, for instance, or country boys on the knees when wearing shorts—but it requires constant stimulation to keep it up and is never quite absolute; one doesn't get the weals but always gets a certain amount of tingling—at least this guineapig does. I wonder if there is any literature on this. I doubt it, for even the formula of the irritant seems to be unknown. Many books say "formic acid"; but they're wrong. Recently we appealed to Kew, and the Director very courteously gave us information. Even as long ago as 1892 Oddi and Lomonaco had "isolated from the common nettle a crystalline alkaloid fatal to frogs in a dose of a centigramme." Also "Haberlandt says that the poison of *Urtica dioica* is an albuminoid substance, held in solution in the cell sap . . . resembling an enzyme." But the latest work seems to be Flury's, who says that it is not formic acid, but a non-volatile, unsaturated acid substance. What a pleasant field for experimentation! If you incline to the masochistic left, then on yourself; if you're a stern, sadistic right-winger, then on your patients or family. Does a well-nettled arm grow a good crop of impetigo? And what do the animal ringworms do? And that pet we cuddle to our bosoms, *P. versicolor*, how likes he nettled skin? And is there honey still for fleas upon well-nettled knees?

* * *

I've never quite taken to this American habit of calling them World War I, II, &c.: it suggests a long series to follow. I prefer Ellinor's more hopeful terminology, by which 1914–18 is the Antepenultimate War, and 1939–45 the Penultimate. The next one will thus be the Ultimate; "unless," she adds, "anyone survives it."

* * *

He was a tall thin miserable stooping specimen who hobbled dejectedly about the hospital. His story was that he had been put on an assault course, with his flat feet. The other patients, with a nice sense of style, at once christened him "Twinkletoes." In two days he saw the joke, and in four days he was cured.

Letters to the Editor

PARTIAL STARVATION IN PRISONERS-OF-WAR

SIR,—The following impression of about 300 cases of starvation in ex-prisoners-of-war, treated at Pinder Fields Emergency Hospital in the first half of May, may be of interest. These men had been on forced marches in Germany, a fair proportion from Lamsdorf. It is hoped that this short review will provide an early follow-up of Dr. McLardy's observations (*Lancet*, Aug. 11). Because of the large number of cases investigations could not be as full as was wished, and withholding treatment with a view to providing controls was obviously not justified.

The clinical picture may be considered under the following headings—

VITAMIN DEFICIENCIES

Vitamin A.—The dry scaly "pavemented" skin on limbs and trunk is believed to be due to vitamin-A deficiency.

Vitamin B_1.—About a quarter of the patients seen here presented reduced or absent knee- and ankle-jerks, with sensory impairment of glove-and-stocking type in the legs, together with paræsthesiæ of varying degree; similar changes in the arms were less pronounced. Impairment of hearing was not complained of, but was not specifically inquired for; optic neuritis was looked for but never recognised. No direct evidence of beriberi heart was found.

About a third of the cases had severe diarrhœa on admission; this tended to be associated with signs of peripheral neuritis. All cases had repeated stool examinations and in no case was a pathogenic organism isolated; fats were not excessive. Half of these cases were treated with sulphasuxidine which appeared to have little effect; the other half with kaolin, which brought relief. All cases were treated with 'Benerva' 50 mg. intramuscularly daily, as suggested by J. S. Brown and H. C. Trowell (*Lancet*, 1944, ii, 812), in the belief that after vitamin-B_1 deficiency the intestinal mucosa is unable to perform its function of absorption. In the absence of controls no conclusions could be drawn as to the value of this treatment, but it appears not unreasonable to postulate that vitamin-B_1 deficiency may play a major part in the causation of starvation diarrhœa. Even if the German ration contained sufficient vitamin B_1, which seems highly unlikely, it appears very improbable that sufficient would be absorbed from the intestine for the patient's needs in the presence of "enterocolitis." A possible vicious circle thus becomes apparent. Almost all these cases cleared up within three days under this treatment.

Vitamin B_2 group.—(a) *Nicotinic acid:* A high proportion of patients presented well-marked tanning of the exposed surfaces, which is thought to be a pellagrous manifestation; in most the tongue was stripped and sore, or had recently been sore. (b) *Riboflavine:* There were about a dozen cases of "perlèche" in varying degree. There was never any evidence of mental change ascribable to vitamin-B deficiency.

Vitamin C.—There was no evidence of scurvy. Purpura was not seen and Hess's capillary test over a small series was negative.

Vitamin D.—Dental caries, often extreme, was common, but it is of interest that oral sepsis and gingivitis were almost entirely absent.

PROTEIN DEFICIENCY

Response to intravenous plasma in œdematous cases was uniformly dramatic. About 40 cases were so treated.

ANÆMIA

No case of macrocytic anæmia was recognised; hæmoglobin levels and red-cell counts were normal or only slightly below normal.

VASCULAR CHANGES

Pulmonary embolism following thrombophlebitis.—Chest radiograms revealed shadows in keeping with pulmonary embolism, which Dr. H. L. Milles (*Lancet*, June 2) puts forward as the cause of hæmoptysis and sudden death in these patients.

Paræsthesiæ (numbness, tingling, burning) in the tips of fingers and toes were frequently noted, and were not usually associated with objective signs of peripheral neuritis. During the period of observation (up to a month) little improvement occurred, and in view of the extreme peripheral distribution it was felt that they were of vascular rather than nervous origin.

PULMONARY TUBERCULOSIS

About 5% of the 300 patients gave chest films suggestive of active tubercle.

The most striking findings were gross vitamin-B-complex deficiency and nutritional œdema. Treatment consisted in rest; high-protein and low-residue diet as soon as tolerated; plasma by intravenous drip; and massive vitamin replacement (fresh baker's yeast 2 oz. daily; nicotinic acid 250 mg. daily; vitamin B_1 by injection; 'Radiostoleum,' 20 minims a day; 'Avoleum' and riboflavine where specially indicated). The results were very satisfactory, and patients showed a surprisingly high resistance to coincident illnesses such as pneumonia.

Pinder Fields Emergency Hospital,
Wakefield. J. R. EDGE.

SIR,—In your last issue (p. 261) Lieut.-Colonel G. I. Scott and I described a neurological syndrome, consisting mainly of retrobulbar neuritis, nerve deafness, and ataxic paraplegia, which was observed among German prisoners-of-war in the Middle East. The probable cause was thought to be deficiency of the vitamin-B complex, but there was not enough evidence to incriminate any one component of it. Beriberi was absent and pellagra and riboflavine deficiency were uncommon in the affected community, but chronic diarrhœa and dysentery were rife. Treatment with diet and vitamin B was not very effective.

The opinion that the disease was due to a vitamin deficiency could be contested. It may be of interest, therefore, to report that since the paper was written I have examined a small number (23) of repatriated British prisoners-of-war from the Far East and have found evidence of a similar neurological condition in some of them. Briefly, the findings were as follows: 10 were normal; 7 had beriberi polyneuritis; 8 had bilateral retrobulbar neuritis with central scotomata; 3 had ataxic paraplegia; 3 had nerve deafness; and 2 had paresis of the vocal cords.

From the histories it was deduced that 3 of the 23 had had pellagra. In nearly all there was a history of chronic diarrhœa and symptoms and signs of riboflavine deficiency. All but 6 had had beriberi; it was "dry" in 14 and "wet" in 3, and 6 had had both forms. In 12 of these 17 cases there were residual symptoms or signs varying from numbness and paræsthesiæ of the feet, or œdema of the ankles, to severe polyneuritis with anæsthesia of the trunk and face. No cardiac abnormality was observed, and in 3 patients examined with the electrocardiograph the tracings were normal. Radiography of the gastro-intestinal tract in 7 cases revealed no abnormality.

Deterioration of vision was a complaint in 9; 3 others said that their sight had deteriorated and since recovered. Central scotomata were found in 7 cases; the peripheral fields were constricted in 3, and 1 of the latter had normal central vision. The majority said that during captivity vision varied according to the diet, the condition of the bowels, and the physical effort expended. Diarrhœa and physical labour aggravated the visual weakness, which in some cases is said to have been great.

Nerve deafness was found in 3 patients: it was moderate in 1 and slight in 2. Tinnitus was not mentioned. Severe deafness is said to have occurred in other prisoners, and like visual failure, the disability varied.

Weakness and hoarseness of the voice had developed in 2 patients. In both the condition was improving fairly rapidly, but in 1 there was loss of tension in the vocal cords due to weakness of the thyroarytenoid muscles, and the voice had been almost wholly lost for a month during a severe relapse of beriberi. It is of interest to recall that Jacob Bontius,[1] who gave us the first description of dry beriberi, stated that loss of voice was a characteristic sign and that he himself, when suffering from the disease in Batavia, was for several weeks unable to converse except in a whisper.

Polyneuritis (7 cases) did not present any unusual features.

1. Bontius, J. (1645) De Medicina Indorum, Vol. iii, chap. 1 (Beriberi). A translation of this chapter is to be found in E. B. Vedder's book on Beriberi (New York, 1913), p. 5.

The legs were more affected than the arms and recovery was slow.

Sensory ataxia (3 cases) was precisely similar to that seen in the German cases. The arms were unaffected. There was no weakness or wasting, and tendon reflexes were exaggerated. Sensory loss affected deep modalities rather than superficial sensation, and there were no pyramidal signs.

Blood-counts were made in 15 patients, and 10 showed hypochromic anæmia. In 7 this was slight (4–4½ million red cells); in 2 it was moderate (3½–4 million) and in 1 patient, who had ankylostoma infection, the count was 3 million.

Test-meals were done in 13 patients. Achlorhydria was found in 5, hypochlorhydria in 1, and normal curves in the remainder.

These men were taken prisoner in Burma and Malaya in the winter of 1941–42, and had all been captive for more than three years. Most were held in Rangoon city jail and in camps in Thailand, and were released last May. A few were transferred to Manila where they were freed by American Forces in February. There were no officers among my patients, and some of their statements may be inaccurate; but the following observations can be made.

The diet was thoroughly inadequate in most camps. Bread, meat, milk, and eggs were rarely received. One patient said he had two small loaves of bread in three years; many had had no bread at all. A calf was allotted to one camp, of about 1000 men, each month; the meat was often inedible. Most of the food consisted of rice and vegetables. The rice was not milled and each man was given about 1 lb. a day. The vegetables comprised pumpkin, marrow, cucumber, spinach, and sweet potatoes in season. Ordinary potatoes were rare. Cooking facilities were primitive and little food could be purchased. Many men worked in labour squads. Loss of appetite was universal (contrary to the popular notion that a starving person will eat anything). A few patients, however, apart from scrotal dermatitis, scabies, and bouts of fever, seem to have suffered little. They lost weight but soon regained it when they were released, and when I saw them a month or six weeks later they were in good general condition.

Dysentery, chronic diarrhœa, constipation, and weight loss were almost universal. Beriberi was rife and accounted for "hundreds" of deaths; the dry form was the commoner, but the wet form was more deadly. Pellagra was probably rare (?), but riboflavine deficiency, especially as manifested by scrotal dermatitis, was widespread. "Nearly everyone's scrotum peeled off many times each year," and the men had an appropriate name for this affliction. Failure of vision was a common symptom (roughly 25%); the occurrence of deafness and alteration of voice were recalled by only a few patients.

The association of the symptoms and signs of retrobulbar neuritis, nerve deafness, and sensory ataxia, with beriberi, riboflavine deficiency, and possibly pellagra, in this group of patients, supports the view that similar neurological phenomena in the German series in the Middle East were due to deficiency of the vitamin-B complex. Of the 6 patients in the British series who did *not* have beriberi, 5 did not develop any neurological disturbance. In several cases in which the latter did develop, the beriberi was transient and mild. In all probability deterioration of vision also took place in the absence of other beriberi phenomena. Although in 2 of the 3 cases of sensory ataxia this condition followed beriberi polyneuritis—and in the 3rd it followed beriberi œdema—the signs were identical with those observed in the German series, where polyneuritis was not seen. A lesion of the posterior nerve-roots is thus possible in these cases. The spinal cord is usually little affected in beriberi. The evidence suggests that dysæsthesiæ of the feet were not always followed by beriberi neuritis; so a primary neurological lesion may not always be responsible for such symptoms.

On the whole, the neurological disorders in the British group of patients have shown a greater tendency to remission and spontaneous recovery than those in the German group. In both series outward appearances were usually normal.

I wish to thank Majors E. Epstein and C. Cockburn, RAMC, for some of the scotometric reports, Major J. A. Kilpatrick, RAMC, for his report of a laryngeal examination and Dr. D. R. Cameron for the electrocardiographic findings.

York. J. D. SPILLANE.

DEMOBILISATION OF DOCTORS

SIR,—During five years in the Navy I have considered myself lucky if I have had two hours' medical work a day: in spite of carrying out at various times the duties of cyphering, censoring, and wine-catering, and of horticultural and educational officer, I have found it hard to employ my time usefully.

Now that the war with Japan is concluded, is it too much to hope that the number of doctors on a cruiser (for example) will be reduced from 3 to 1? And to have a medical officer on every destroyer surely seems extravagant with hospital facilities usually available within 24 hours' steaming?

BORED MO.

IS THERE A SHORTAGE OF DOCTORS?

SIR,—Dr. Butcher's experience is precisely similar to my own. Like him, I was released a month or so ago; and being unable, temporarily, to return to my own practice, owing to housing difficulties, decided to give some overworked civilian doctor a rest by being his locum.

I therefore applied to my old medical school for a locum tenens job, expecting to be inundated with replies from which I would take my choice. Were we not told by the CMWC that civilian doctors were being "literally worked to death"? To my surprise they had absolutely nothing to offer. I applied to an agency with the same result, and now after over a month without a single reply to my applications, I am restarting my own practice next week.

I may add that, visiting hospitals where I have previously worked, I found no shortage of medical staffs, which in some cases had actually been increased lately.

I have always been very sceptical about the alleged medical man-power shortage, and this experience has done little to dispel my doubts.

MO, 1939–45.

SIR,—I think that one of the answers to Dr. Butcher is to be found in the fourteen guineas a week fee for locums (*vide* British Medical Bureau). This is a rise of 75% compared with the 20% rise in panel fees, and makes the tired GP (and he is *very* tired) think twice before he employs assistance.

ONE OF THE TGPs.

MEDICAL FILMS

SIR,—A catalogue of all the medical films in Great Britain is now being prepared by the Royal Society of Medicine in coöperation with the Scientific Film Association. It would be appreciated if any persons holding films of medical or paramedical interest, who have not already been asked for details, would communicate with the Film Cataloguer, Royal Society of Medicine, 1 Wimpole Street, London, W1. By so doing they would not commit themselves or their films, but would enable the catalogue to be complete.

GORDON GORDON-TAYLOR
President, Royal Society of Medicine.
ARTHUR ELTON
President, Scientific Film Association.

SIR,—The correspondence initiated by Captain McIndewar's letter of July 14 is raising important questions. Commenting first on Dr. Howard Jones's letter of Aug. 18, we apologise for stating that the British Council deals only with discussive films; as Dr. Howard Jones suggests, we had judged by the two British Council medical films so far published here. It is good news that teaching films are going into production and we can only regret that they will be so few.

As regards an assessment of the value of films in medical teaching, surely the reason why medical teachers have not spoken up on this is that they have little experience of using films and therefore wisely say nothing. A good deal of research has been done in this country as well as in USA in schools and in the Services with encouraging results (e.g. Bean, K. *Sight and Sound* 1944, **13**, 33; Scupham, J. *Ibid*, 1944, **13**, 75; Welsh, D. *Ibid*, 1944, **13**, 89; Meredith, G. P. *Nature, Lond.* 1944, **154**, 353). We are not unaware of the limitations of the film, but we do regard it as a "useful piece of apparatus

for student and teacher" and the commonly favourable opinion of those who have employed it is hardly to be ignored. (After all, it is very hard to find statistical proof of the value of artificial pneumothorax or even of sanatorium treatment for pulmonary tuberculosis.)

It is also suggested that the bulk of medical films may be always "a few years out of date" because of the expense of frequent re-editing. This implies a misunderstanding of the part played by a film. A film represents an area of curriculum corresponding to a few pages of a textbook. When a textbook comes to a new edition, it is only partly rewritten; the chapter on physical examination of the lungs remains untouched while the section on penicillin treatment of pneumonia is revised. When adequately made, the films on anatomy, embryology, and descriptive medicine (e.g. chorea compared with athetosis) will not need re-editing for many years.

Dr. Howard Jones doubts "whether centralisation would help very much in the present experimental stage." As regards the production of medical teaching films we thoroughly agree. It is to be hoped that film production by a variety of organisations—medical schools, university departments, governmental bodies, commercial firms, and private individuals will continue. The "centralised plan" that we recommended is for *coördinating* medical film production. Some body is needed to prevent overlapping in production and to facilitate the making of the films most urgently needed.

In agreeing that the present British medical film production is sporadic, haphazard, and uncoördinated, Dr. Howard Jones points out that the same applies to medical book production where the supply is satisfactory. But whereas the author and publisher of a medical textbook may reasonably hope to get a financial return on their outlay, the returns from the sales of medical teaching films are so small that at best only a fraction of the outlay can be recovered. The result is that there will be no adequate supply of medical teaching films unless they are sponsored with in most cases no expectation of monetary return. The present provisions for libraries, hospital beds, or non-theatrical films in this country seem to give closer analogies.

If a medical school in Brazil wants a film illustrating some aspect of British medical practice, it can apply to the British Council, which, if the film appears worth making, can sponsor its production. Who in this country will do the same for a British medical school?

Scientific Film Association,
16, Princes Gate,
London, SW7.

RONALD MACKEITH
Chairman, Medical Committee.

AMŒBIC DYSENTERY

SIR,—It is difficult to appreciate the value of Lieut.-Colonel W. H. Hargreaves's work on chronic amœbic dysentery (described in your issue of July 21) unless one has tried to cure these cases by the established forms of treatment. It is indeed a great advance.

My experience of six cases treated by his method amply confirms his claims.

He does not, however, seem to have attempted to identify the type of organism responsible for the secondary invasion of the amœbic ulcers. As long ago as 1928 Acton and Knowles [1] stressed the importance of streptococci in resistant cases and commented that the whole bacterial flora of the fæces appeared quite changed from the normal. With this in my mind I used sulphapyridine and sulphaguanidine in these cases in India, with symptomatic improvement.[2] Penicillin was not at that time available, nor was it possible to examine the bacterial flora of the stools. Since my return to this country I have taken swabs direct from the ulcers at sigmoidoscopy in four cases. These were plated on blood-agar. Two cases grew a hæmolytic streptococcus, one *B. pyocyaneus*, and one no abnormal organism.

Having had few chronic resistant cases recently, I hope that someone more favourably placed will go into this question more thoroughly.

Before leaving the subject of amœbiasis I would like to emphasise the difficulties which confronted so many medical officers responsible for the treatment of these cases in India. Often emetine hydrochloride was the only drug available, and for a short time in the autumn of 1942 not even that. EBI and chiniofon were in short supply and their use was very properly concentrated in special centres. Shortage of beds meant that only those cases which were well established as chronic relapsing cases could be admitted to these centres for the combined treatment.

At Calcutta, the centre with which I was best acquainted, the EBI was given crushed as a powder. The technique of administration of chiniofon retention enemata left something to be desired. There seemed to be a prevailing fiction among the orderlies who administered these that "washouts" through a size 8 catheter would clean the bowel properly. Also they tended to be careless about the temperature and the rate at which the enemata were given, making retention more difficult. This failure in technique escapes many medical officers, although it is their responsibility to see that the orderlies are properly trained. The same criticism applies in places in this country.

Ulcerative colitis.—I have so far used Lieut.-Colonel Hargreaves's treatment with sulphasuxidine and penicillin, the former both by mouth and retention enemata, in four cases. In two the condition was confined to the rectum and both were rapidly and greatly improved. The final state was a friable, slightly granular mucosa in the rectum. I do not feel confident that these cases are cured. The other two cases had extensive ulceration in the pelvic colon and sigmoid, one with stenosis. Only slight improvement could be seen at sigmoidoscopy in these, though there was an increased feeling of well-being in both. I fear that this will not prove to be a specific treatment for all cases of ulcerative colitis. I would point out that there is a form of ulcerative proctitis which carries a good prognosis.[3] My first two cases may have been of that type. It would be interesting to have more details of Lieut.-Colonel Hargreaves's cases.

Military Hospital, Chester. A. M. M. PAYNE.

SIR,—I should like to support Lieut.-Colonel Hargreaves in his remarks on the necessity of using bactericidal drugs in conjunction with emetine. I would go further and suggest they should be used in all cases of amœbic dysentery, fresh or old, and that they should be administered concurrently with the emetine as well as before it.

In the last two years 70 acute and chronic cases have been treated by me in the Middle East with 12 grains of emetine by daily one-grain injections, and sulphonamides by mouth at the same time. The sulphonamides used were, in most cases, sulphaguanidine (3·5 g. four-hourly for 10 days to a total of about 220 g.) and sulphapyridine or sulphathiazole (0·5 g. five times daily for 7 days). This mixture gives a blood sulphonamide level of 8–12 mg. per 100 c.cm. and ensures that organisms are attacked from the blood-stream as well as from the gut (Paulley, J. W. *Lancet*, 1942, ii, 592, and Scadding, J. G. *Ibid*, 1944, i, 784).

As Lieut.-Colonel Hargreaves has recently pointed out, amœbic dysentery has one lesion in common with all other forms of dysentery—namely, ulceration of the colonic mucosa and hence a secondary bacterial invasion of the colonic wall. These conditions may well prevent emetine ever coming in contact with a number of entamœbæ. There is good evidence that sulphonamides (and now also penicillin) act on at least some of these bacterial invaders in dysenteries. Why should they not be used in *all* cases of amœbic dysentery? When it is remembered that a far from insignificant group of fresh cases of this condition, and even some chronic ones, have concomitant bacillary dysentery, the argument for using sulphonamides in this way is strengthened. (Penicillin has no action on dysentery bacilli.) Furthermore, one has the uneasy suspicion that after the standard treatments a proportion of amœbic dysenteries become chronic non-specific dysenteries. I suggest that any agents, such as sulphonamides and penicillin, which help to clean up the colonic ulcers and secondary sepsis, may be expected to assist in the cure of amœbic dysentery.

Of late years, doubt has periodically been thrown on the amœbicidal potency of emetine in the body. It is considered by some that more active amœbicides should

1. Acton, H. W., Knowles, R., Dysenteries of India, Calcutta, 1928, p. 137.
2. Payne, A. M. M., *Lancet*, 1945, i, 206.
3. Manson-Bahr, P., Dysenteric Disorders, London, 1939, p. 435.

be looked for. No-one would deny the importance of further search, but surely it is time we made the best use of drugs we have. In the first place, it is problematic whether in emetine we have *not* got a drug of extreme amœbicidal potency; it seems difficult to imagine one of greater. There is plenty of in-vitro and in-vivo evidence of this. The usual dramatic response of the acute symptoms of intestinal and (especially) hepatic amœbiasis to injections of emetine, is well known and frequently diagnostic. But just as complicating factors, such as abscess formation and secondary infection, make emetine less effective in hepatic amœbiasis, similar factors must always be present in the gut condition which will often militate against radical cure using emetine or emetine bismuth iodide (EBI) alone. May it not be likely that "emetine resistance" is no more than a locking away of *Entamœba histolytica* in ulcers, granulation tissue, and abscesses which are largely kept going by bacteria? Like Lieut.-Colonel Hargreaves, I have never been convinced of emetine resistance.

I suggest that, at any rate as a temporary measure, more efforts be directed towards emetine adjuvants than to new amœbicides. Finally, however easy it becomes to kill off all the *E. histolytica* in the gut, there will remain a percentage of cases whose gut does not heal and who persist with chronic non-specific or bacillary dysentery. (I have recently seen a patient with chronic Shiga dysentery, returned a short time ago from West Africa. In 15 months he had had four standard treatments for proved amœbic dysentery contracted in February, 1944.)

It was the theoretical considerations set out above which made me resort two years ago to the treatment outlined. No doubt Lieut.-Colonel Hargreaves was influenced by the same line of thought. I hope that my results may later be published in the form of a thesis: at present they are not complete, since a two-year follow-up of the cases is in progress. But I can say that in general I have been very favourably impressed with the results obtained compared with those obtained with the standard treatments. It is probable that all patients would require two courses of the treatment outlined, and possibly more if chronic. I am not prepared to say that EBI would not be as good, or better, than emetine in one or both of such courses, but it was very seldom used in my series.

More work should be done using EBI combined with sulphonamides, comparing its efficiency with emetine in this combination. Penicillin should be tried more extensively, but its usefulness will probably be limited to the chronic, or the severe acute case.

Military Hospital,
Shaftesbury. N. F. COGHILL.

DANGER OF INUNCTION WITH DDT

SIR,—In his preliminary communication of May 5 (p. 563) Dr. B. G. T. Elmes recorded the rapid and complete cure of notoëdric mange in rabbits as a result of application of a 5% solution of DDT in acetone. At this laboratory we had previously observed a fatal result in rats after the use of only a 2% solution of DDT in liquid paraffin when applied to the ears, nose, feet, and tail (*Vet. Rec.* May 5, 1945, p. 210); so it was a surprise to read that a 5% solution in a fat solvent such as acetone could be safely used in rabbits.

To test the superior resistance of rabbits to the toxic action of this drug, we dressed four rabbits, 8 weeks old, with a 5% solution of pure DDT in acetone, applying it liberally to ears, head, and feet, which are the sites in the rabbit likely to be affected by mange. Next morning, some 20 hours later, all four rabbits were seen to be very severely affected: the worst, being in extremis, was killed; a second one died two days later; and the other two made a slow recovery during the succeeding 10 days.

On obtaining this result it occurred to us that an error might have been made in the reproduction of Elmes's report and that "0·5%" had been intended. The dressing of ears, head, and feet was therefore repeated with the weaker solution on four other young rabbits of the same age. On this occasion the fatal result did not take place, but the rabbits nevertheless showed definite symptoms of DDT poisoning, these being sufficiently well-marked on the following morning to amount to paralysis of the hind-quarters in two of the animals; muscular tremors were pronounced in the third; and slight muscular tremors were present in the fourth. All of these rabbits recovered during the next few days.

To test the possibility of the variation of our results from those of Elmes being due to the immaturity of our rabbits similar dressings on ears, head, and feet were carried out on rabbits 8 months old; two rabbits were first treated with a 0·5% solution and four other rabbits treated later with a 5% solution of pure DDT in acetone. This time there was no apparent response to the weaker solution, but the response to the 5% solution was very marked indeed; on the following morning two of the rabbits were lying on their sides in a condition of spasmodic rigidity, one in opisthotonus. These were considered to be beyond any chance of recovery and were destroyed, as was the third which was found in a similar condition on the second morning. The fourth rabbit showed very pronounced muscular tremors, great nervous excitability, and a tendency towards clonic convulsions if the cage were moved, or on the occurrence of any unusual sharp noise or movement near the cage. This rabbit was killed on the fourth day while still in the same condition in order to carry out a determination on the blood-magnesium concentration. This proved to be normal.

Elmes's report on the success of the treatment concluded with a caution. He remarked that the treatment of human scabies on lines similar to those which he had used in rabbits suggested itself but he recalled the recent note by Wigglesworth, reporting a case of DDT poisoning in man which made it clear that a solution in acetone would be unsafe for extensive application. The additional observations here reported emphasise the danger of inunction with DDT.

Veterinary Laboratory,
Ministry of Agriculture. E. L. TAYLOR.

VISUAL EDUCATION

SIR,—In the valuable article by Mr. A. S. Vaughan Thomas (Aug. 25) I was greatly interested and pleased to see the following:

> "It was generally agreed that the short instructional film, supplemented by some form of 'still' presentation to isolate moments or facts for closer examination, taught more than the documentaries of the commercial cinema."

Having used films, made under my personal supervision, in teaching the management of syphilis and gonorrhœa to students from 1923 until I left St. Thomas's Hospital in 1936, I am convinced that the principle embodied in this extract is right. In my demonstrations I used a projector which could be stopped at will, leaving the picture on the screen without harming the film, and once weekly throughout each winter I showed one thousand-foot (34 mm.) reel, stopping to emphasise points of importance, especially in technique. I am convinced that there is no better method—slow motion is much too fast—of demonstrating technique to a large audience, and approval of the method by students was testified by the size of the class. The film-showing was followed by a clinical demonstration.

I agree also with the opinion expressed by Mr. Thomas's students that the animated cartoon is the best method of teaching a principle, and in my films I made much use of this method; one set aiming to demonstrate the principles of the Wassermann test certainly seemed to amuse my students, if it did nothing else.

London, SW1. L. W. HARRISON.

TREATMENT OF MALARIA

SIR,—The results obtained by Dr. Kelleher and Dr. Thompson with a quinine and pamaquin course (Aug. 18) are very good and if confirmed would indicate that this routine is among the best available. It is, however, far from satisfactory to have to record a relapse-rate even of 10% over so large a series, and it is perhaps not too much to hope that further coördinated research, such as is being carried out in the United States (*J. Amer. med. Ass.*, March 17, 1945, p. 650), may be undertaken.

I have had considerable difficulty with patients who evade regular oral dosage of quinine, and the parenteral method overcomes this difficulty. My very small series—consisting, as it does, of mixed subtertian and benign tertian cases—shows only that intramuscular solvochin produces moderately satisfactory results, and I make no extravagant claims for it; but under civilian conditions we cannot keep patients to the number of 1410 under

observation for five months and my plea was only for a controlled investigation under conditions more favourable than those under which I have to work. Minute analysis of such a small series as mine would not serve any useful purpose, but it should not be difficult, under Service conditions, to carry out an investigation on a scale sufficient to decide the matter once and for all.

May I add that the experience of Dr. Kelleher and Dr. Thompson with mepacrine in benign tertian entirely confirms my own.

London, W1. ALEC WINGFIELD.

INTESTINAL MUCOSA IN ULCERATIVE COLITIS

SIR,—To the 5 cases of ulcerative colitis which did not respond to pig's small intestine, as recorded by Dr. Morton Gill, I regret to add another failure. The patient is a Dutch cook on a freighter, who has a peculiar boyish appearance and manner. There is no evidence of food allergy. This sailor exhausted the usual gamut of treatment from the beginning of his illness in January, 1943, until May, 1944, when I read Dr. Morton Gill's hopeful results with the above treatment. The patient religiously ate ½ lb. of uncooked small intestine of pig every day for 4 weeks with justifiable grumblings but without the slightest improvement. Finally, last October a terminal ileostomy was performed, and he almost died immediately from dehydration. After a stormy convalescence he managed to shuffle out of hospital for his wife to attend to the continuously discharging ileostomy, over which he has still no control. The abdominal skin became excoriated. He then had a doubtful attack of Wernicke's encephalopathy, and finally a 12-in. prolapse of the proximal "anus," yet he still continues to pass daily mucus and occasional blood per rectum. He has had a fair trial of the short-circuit and been patient and courageous throughout the miserable existence; and I feel that now, for humane reasons, the ileostomy should be replaced, although it may mean the risk of a flare-up.

Netherlands Ministry of Shipping. R. F. L. LOGAN.

SULPHADIAZINE DYSURIA

SIR,—Since our report published on June 16 (p. 751) we have seen three further cases in which the condition of the bladder was of some interest.

The first was seen post mortem. The bladder wall was enormously thickened and the mucosa thrown into thick bulging plicæ, taut with œdema, which were encrusted with sulphadiazine crystals and amorphous deposit. The œdema quite obscured the ureteric orifices and even partially obstructed the urethral outlet. About 2 oz. of bloodstained urine was present.

The second, seen at cystoscopy, again presented generalised œdema of the bladder mucosa. The whole trigone seemed distorted and obscured, though the œdema was not confined to this area, but appeared wherever the bladder wall was visible. Blood oozed freely wherever the ureteric catheter touched the mucosa.

The third, also seen at cystoscopy, showed this œdema, but it was limited to the trigone area.

This condition, however common, is not invariable. We did not see it in any of our previously cystoscopied cases. Perhaps so great an œdema suggests an allergic manifestation.

R. P. JEPSON.
CMF C. W. M. WHITTY.

VITAMIN B_1 IN PALATABLE FORM

SIR,—On July 28 you printed a note from me on a palatable drink made from yeast for use as a supplement to diets deficient in vitamin B_1, or as a catalyst to excess carbohydrate taken in white bread, cakes, scones, and buns. This has led to many inquiries.

The first difficulty appears to be, what yeast to use? I use the 1 lb. (2*s.* 8*d.*) tin of dried yeast sold by the Standard Yeast Co. Ltd., Lamb Distillery, Church St., Chiswick, London, W4. This yeast is active and becomes aerated to a good head of froth in 40 minutes. It has not failed me once. Should it do so the method is at fault. The following details must be followed:

(1) Avoid cold draughts. (2) Half-fill a tumbler with water definitely warm but not hot. (3) Add a pinch of sugar. Up to a teaspoon if desired and available. (4) Add a teaspoonful of yeast and stir, leaving spoon in glass. Two teaspoonfuls if desired. (5) Cover quickly with a newspaper (in case yeast froths over) and add a cosy, a small rug or blanket, or a shawl. (6) Leave for 40 minutes. Remove covering and stir vigorously, whipping the froth to a good head, and cleansing the side of the glass, with the spoon. (7) Quaff.

On the advice of a physician bitter tonics or other medicaments may be added.

T. H. SANDERSON-WELLS.

Obituary

ALFRED SALTER

M D LOND.

Alfred Salter, MP for West Bermondsey till a few weeks ago, died in Guy's—his alma mater—on Aug. 24 at the age of 72. Hard work, an exceptional memory, and above all a puritan passion made him what he was. A brilliant schoolboy, he passed from Roan School, Greenwich, to Guy's where he graduated in 1895 with triple first-class honours, and in the following year he took his MD and was awarded the gold medal. In 1897 he was awarded the Golding-Bird gold medal and scholarship in public health and the Gull research scholarship in pathology, and after holding house-appointments at Guy's he joined the British Institute of Preventive Medicine as a bacteriologist for three years.

Anglo

In 1900 he rented a shop in Bermondsey and "squatted." Consultations were sixpence. Within eighteen months he was joined by Richmond and Stratton, and shortly after by Goldie and Lowe—a partnership of five. From the first he attracted crowds and worked prodigious hours. The queues who waited for his arrival enphasised in his mind the need to import more doctors into the slums, if they were to attain leisure and poise in their approach to each patient. He sponsored the Bermondsey health centre for extending diagnostic facilities, and the scheme for sending tuberculous bone cases to Switzerland at public expense. He marked large numbers of panel prescriptions "urgent" for patients who attended after chemists were shut, and successfully defended this extra expense against the Ministry's action. As his cigars were an affront to the poverty of his patients he early gave up smoking as a useless, harmful, and discourteous habit.

His professional and political interests lay in Bermondsey, but his leisure was spent in open air and the country; and Salter's trees, which he fought to have planted, now line all the streets of his borough, while a cottage estate near London Bridge, on land which cost £10,000 an acre, bears witness to his dictum, "Flats are not homes." In his last years he often expressed the fear that trends of social policy such as government housing would lead to one-class boroughs with disastrous segregation of the forceful and intelligent from those not so endowed. He felt strongly that the doctor and the lawyer, the higher civil servant, the architect, and the business manager must live as well as work among the artisans and labourers, if mutual respect and understanding were to be preserved.

Nicknamed Citizen Salter at Guy's, he served apprenticeship as borough councillor and guardian and then as LCC member from 1905 to 1910 before entering Parliament, after several defeats, in 1922. "For the last two years," writes a fellow MP, "Salter appeared in the House of Commons only at intervals. But his name will be found on division lists during the life-time of the Coalition, usually voting with a minority for causes associated with internationalism, peace, and the welfare of under privileged people." It is not in the limelight incidents, such as his trial by the House of Commons for accusing members of drunkenness, nor his seven-day fast to draw attention to starving Europe, that one most

clearly sees his character, but in the pertinacity with which he circumvented opposition and trusted to education. Month after month throughout the years, at each meeting of his local political party, as chairman he would edge in a carefully prepared talk on some social or international problem—dispatching the humdrum business with a touch of hauteur and autocracy which the sensible people were quite ready to forgive.

As a Quaker Salter was a pacificist; but he was also a fighter, and, writes E. C. M., "he launched his attack on social misery, squalor, and alcoholism, secure against his chairman's ruling, by advancing from the table, with long arms swinging like windmills, on his intimidated audience. He upheld the dogma that a definite proportion of the community cannot touch alcohol in any form without becoming its slave. He pushed this view to its logical conclusion and he did not understand how the evidence that satisfied him could fail to carry conviction to others. But he was quite aware that he was not as other men and rejoiced in it."

HUGH CABOT

C M G, M D

News has come of the death of Dr. Hugh Cabot of Boston, Mass., a distinguished surgeon and medical philosopher, a great American, and a warm friend of Britain. He will be mourned here by many colleagues of the older generation who knew him in the days of the BEF in France from 1915 to 1918, and by a devoted band of Bart's men who one after another were assistants in his department of surgery at the University of Michigan from 1924 onwards.

His life was a fascinating one; his name is enough to suggest that. A stocky little man, he was a great fighter with a fearless courage in defence of what he conceived to be the right: crystal-clear in his thinking, quick in repartee, honest and completely outspoken. He was a great teacher and an inspiring leader of young men; encouraging with his criticism but setting high standards in what he required.

His younger days were spent in the traditional atmosphere of the great New England family to which he belonged, and among their friends who provided so many of the leaders of American thought during the last quarter of the 19th century. The pioneer spirit of his forebears was encouraged by his life on the Atlantic seaboard, and particularly his attraction for the seamanship of the Gloucester fisherman with whom as a boy on many occasions he sailed for weeks on end. He must have been a tough youth, and he certainly remained so until a dozen years ago when he finally gave up the yearly explorations which he used to make into the north-western provinces of Canada. He spent much of his vacations hunting moose and caribou, charting river courses, and living with and like the North American Indians, with whom he had a remarkable affinity. He was like an Indian chief, with his insight and simple faith, his compelling dominance and uncanny wisdom. No wonder he was called with affection "Chief" by all his juniors. It meant far more than the "Chief" which in America is used for any "boss."

Cabot graduated from the Harvard Medical School in 1898, and remained attached to that school and to the Massachusetts General Hospital until 1915, when news was one day brought to his lecture-room of the sinking of the *Lusitania*. He had long distrusted the Teuton mentality, and he made up his mind immediately to leave Harvard, go to England, and join the RAMC as a surgical specialist. He later became one of the consulting surgeons to the British Army in France and remained with it throughout the war, even after the United States declared war on Germany in 1917. Before that his advocacy of the British cause had brought him into conflict with German influences at home, and even with the President of the United States, causing some estrangement until later in the war. It was during those years that his friendship with Sir Anthony Bowlby sprang up, and from this the relationship with Bart's already mentioned. Hume, Corbett, Visick, Capener are men who personally worked with him: Seddon, the late H. P. Nelson, the late John Melly, and J. E. O'Connell are others who followed after in the Bart's tradition at the University of Michigan, to which Cabot had gone at the end of the war as dean of its medical school.

At Michigan he fought (and lost the fight) for a whole-time medical teaching staff: he was not always a diplomat, and it is probable that his pugnacity was his failing. In 1930 he was invited to join the staff of the Mayo Clinic to take charge of one of the surgical services, which he did until he retired in 1936. He had already studied extensively the problems of social medicine, and in 1935 published his book *The Doctor's Bill* in which he examined the conditions of medical practice at home and abroad and showed himself a strong opponent of free and unrestricted competition in medicine. In this he exposed many fallacies, particularly those in the principle of "free choice of doctor." It is scarcely to be wondered at that he made many enemies, and, sadly, among men of high ideals.

In medical literature Hugh Cabot is chiefly known as a urologist. Yet he was a general surgeon and in Michigan was director of the whole department, which, with its subdivisions in neuro-surgery, oral surgery, thoracic surgery, genito-urology, and orthopædics, with its more specialised departmental heads, he grouped around him in a coöperative spirit which did much to counteract the evils which he rightly felt to be associated with specialisation.

It is difficult for an Englishman to assess the worth of such a man. All one can say is that in America he was respected as a great personality, a true friend, and a straight enemy. To the Englishmen who had the privilege of working under him he gave a remarkable insight into American character which will always hold their admiration and affection. British-American brotherhood owes much to such a man.

N. C.

JOSEPH WHITE

M A, M B, B SC GLASG.

Joseph White was born in 1877, the third son of Joseph White of Cambuslang, Glasgow. On leaving Glasgow High School he studied arts in Glasgow University with the intention of going into the Indian Civil Service, and in 1898 he graduated MA with first-class honours and was awarded the Clark scholarship. He decided, however, to enter medicine, and in 1900, when he passed his B Sc, he was placed first in his year. For a time he was assistant to Lord Kelvin, who would have liked him to remain in science because of his outstanding mathematical ability But in 1902 he took his MB with honours, and was placed second in his year. A university travelling scholarship enabled him to study in Paris, Berlin, and Vienna, and gave him an insight into the State organisation of German medicine.

After holding house-appointments at the Royal Infirmary, Glasgow, and at the Glasgow Maternity Hospital of the city, in 1905 he settled in practice at Clapham. Here he found his vocation in unselfish care of the people of the little villas of Clapham. They were mostly neither rich nor influential, and he might with great financial advantage have used his talents in a wealthier neighbourhood, as indeed he was often urged to do. But his patients were his friends and he felt that to leave Clapham would be to betray a trust. Throughout the war, until his health gave way early this year, he remained with his wife in Clapham, ignoring the blitz, though his house and even his car suffered from air-raid damage. The strain and anxiety probably caused the cardiac breakdown which compelled him to retire. In February he moved to Bournemouth, where he died on Aug. 19, leaving a widow with two sons and a daughter.

"The broad and thorough lines of White's education," writes W. S. H., "and his experience of life abroad made him an interesting companion. He always asserted that the National Health Insurance scheme of this country was designed after the German pattern, and he remained to the end strongly critical of Government interference with the autonomy of his profession. Genial and communicative, he was good company either for a peer or a dustman, with a Scottish disregard for differences of social position. He might have been a successful scientist, but the human impulse to help his fellow-men in a more direct way led him to medicine, and his unselfish devotion to duty, without fuss or pretence, made him a near approach to the ideal practitioner. His clinical acumen was rarely at fault. In his patients' interests he had kept himself abreast of the latest advances of medicine, and nothing he could do for them was a trouble. In the quiet streets of Clapham, and by his many friends elsewhere, he will long be missed."

On Active Service

CASUALTIES

DIED

Surgeon Lieutenant ANGUS CHARLES MACRAE-GIBSON, MB LOND., RNVR

Captain JEAN CUNISON NELSON, MRCS, RAMC

Major ALFRED CHARLES GREENE, MB LOND., IMS

AWARDS

DSO

Lieut.-Colonel A. D. MACPHERSON, RCAMC

MC

Captain ROBERT BARER, MB LOND., RAMC

MENTIONED IN DESPATCHES

Major J. A. WRIGHT, RCAMC

MEMOIR

Surgeon Commander JOHN DAVIES, who died at his home in London on Aug. 2, obtained the Conjoint qualification at the Westminster Hospital in 1928. Four years later he took his MB Lond., and in 1932 his MD and the MRCP. After holding house-appointments at the Westminster he became an assistant medical officer at St. Stephen's Hospital, Fulham. When he settled in practice in Hampstead he kept his alert mind fully occupied, holding clinical assistantships at the Royal Chest Hospital and the Royal Ear Hospital and taking a keen interest in psychiatry.

When war broke out he joined up in the RNVR, and after two years at the RN Hospital at Plymouth in 1941 he was appointed neuropsychiatrist to the Eastern Mediterranean Fleet. "Jackie, as everybody called him," writes G. B. W. J., "was a pillar of strength to the Fleet medical officer and to me as consultant to the Middle East Force. I often met him in consultation over difficult cases, and found him a first-rate clinician, full of a cheerful knowledge of men and affairs. Popular with all who knew him, his shrewd judgments of men and his unceasing work made him a wise counsellor, and in times which were not easy his tolerance and kindliness were indeed valuable assets."

Two years later he returned to this country on grounds of ill health, but he served at an RN Hospital until shortly before he died. Commander Davies was 43 years of age and leaves a widow, and a son and daughter.

Notes and News

TUBERCULOSIS ADMINISTRATION

On July 21 the Joint Tuberculosis Council considered the report of a committee which proposes changes in the method of notification of tuberculosis. The report recommends that notification in future be in two stages, of which the first would be a non-committal *intimation* that the disease is suspected. This would allow the doubtful case to be thoroughly investigated by a tuberculosis consultant without any possible "registration stigma" in the event of his turning out not to have the disease. The Council decided to forward this report to the Ministry of Health and to suggest a meeting to discuss methods of achieving its objects. Another report to the Council points out that the financial allowances scheme during the financial year ended March 31, 1945, cost the Exchequer £650,000 as against the estimated £3,000,000 mentioned by the Minister of Health at the NAPT conference. It suggests that the basic monetary allowance under 266/T should be substantially increased and that dependants' allowances should be increased also. Excluding supplementary allowances from local authorities or care committees for extra nourishment, the maintenance allowance is less than the amount given by some public-assistance authorities: "there is little inducement in the scale of allowances to persuade the early case with few or no symptoms and earning good wages, to give up their work while the disease remains early. For many patients, the anxieties of to-day are more potent than the fears of tomorrow, which they hope may never materialise." The Council authorised the issue of a questionary to local authorities on the operation of memorandum 266/T.

The third main subject dealt with was the conversion of hospital and sanatorium staff from Mantoux-negative to Mantoux-positive. A "memorandum of advice" will be published shortly which recommends a month's "work and bed" for staff presenting no symptoms, no radiological evidence, and no significant increase in the sedimentation-rate. For the symptomless with an increased sedimentation-rate, a month's "half-duty and rest" is suggested. For those without symptoms but with enlarged hilar glands and an increased sedimentation-rate, a month in bed is advised, to be followed by a month's "half-duty and rest" if this succeeds. It is most important, the JTC believe, that Mantoux-negative staff should be told that they are negative, and that they are almost certain to become positive. They should also be told that, just as most town-dwellers go through a primary tuberculous infection at some time in their lives and know nothing about it, the same uneventful course is probably the lot of the sanatorium nurse or maid converting from negative to positive.

EPILEPSY

The International League against Epilepsy, founded in 1935, has continued its activities upon a reduced scale during the war. The United States branch has been prominent, and undertook the responsibility of issuing the journal *Epilepsia*, a commitment which had previously been shouldered by the Danish branch. Under great difficulties the Americans issued a copy of this journal during each one of the war years.

It is proposed to resume the annual scientific meetings of the British branch of this league, and provisionally Friday, Nov. 30, has been set aside for the first of these post-war meetings. Further details will be announced later.

Any qualified medical practitioner interested in the scientific or social-economic aspects of epilepsy is invited to become a member, and is asked to communicate with the secretary, Surgeon Captain Macdonald Critchley, RNVR, Royal Naval Auxiliary Hospital, Barrow Gurney, nr. Bristol.

A LINK IN THE ARGENTINE

In Buenos Aires the British Council has helped to establish an Argentine-British Medical Centre, to promote closer relations and the exchange of medical information. The library contains medical books and current journals, and books, articles, and photostatic copies can be obtained from England on behalf of members. The Spanish edition of the *British Medical Bulletin* is distributed by the centre, and it maintains a supply of medical films and arranges for translations of medical material from Spanish into English or the reverse. The facilities of the centre are available to doctors living in the interior of the country, who find the photostat copies of articles specially useful. English classes, including conversation and the reading of medical books, have proved popular. The inaugural ceremony was conducted by Sir David Kelly, the British ambassador, Sir Eugen Millington-Drake, representing the British Council, and Prof. José Arce, dean of the faculty of medical sciences at Buenos Aires. The president of the centre is Prof. Mariano R. Castex.

EDUCATION STUDIES IN SCOTLAND

The Scottish Council for Research in Education[1] describe what must be among the most simple and economical research projects ever launched. The council do exactly what their name suggests. Their membership is widely representative of all fields of education; and with grants from various Scottish education authorities, from the Educational Institute of Scotland, and the International Institute of Teachers College, Columbia University, New York, they have an annual income of around £1500. With this they have provided a central office and staff, have produced their 24 publications, and 10 supplements to the Scottish Educational Survey, and have financed research into a wide variety of educational problems. But they have done far more. Scotland provides an ideal field for educational research—the numbers to be studied are manageable, urban and rural areas show problems of widely different kinds, and the resident population is relatively stable. The council have maintained a liaison between teachers in the field, educational psychologists, the universities, and the training colleges, which must have been of value to all of them. They are working for a higher school-leaving age, and for the provision of child-guidance clinics and health centres by every local authority. The report shows what can be done with limited means.

The subjects of research range from individual problems such as the teaching of large numbers, to more general studies of examination results, their value, and interpretation.

1. Scottish Council for Research in Education: Its Aims and Activities. Publication xxiv. University of London Press. 1s.

Release of Doctors from the Army

The War Office announces that the release of medical officers will be proceeded with up to group 23 by Jan. 20, 1946, in step with the rest of the Army. This announcement is discussed in our leading article.

Return to Practice

The Central Medical War Committee announces that the following have resumed civilian practice :

DR. WILLIAM BROCKBANK, FRCP, 2, St. John Street, Manchester, 3.
MR. GEOFFREY KEYNES, FRCS, 31, Weymouth Street, London, W1.
DR. DOUGLAS MCALPINE, FRCP, 27, Harley Street, W1.
MR. J. LESLIE ORR, FRFPS, 15, Royal Terrace, Glasgow, C3.
MR. EVERARD WILLIAMS, 97, Harley Street, W1.

University of Cambridge

The King has approved the appointment of Sir Lionel Whitby as regius professor of physic.

Sir Lionel, who is 50 years of age, was educated at Bromsgrove School, whence in 1914 he won the senior open scholarship at Downing College, Cambridge. He did not take this up until 1918, having meanwhile served in the Royal West Kent regiment and Machine Gun Corps in France and the Balkans. He was wounded at Peronne in 1918, was awarded the Military Cross, and reached the rank of major. In 1922 he gained the Freeman scholarship and the Leopold Hudson prize, and in 1923 the Hetley clinical prize, at the Middlesex Hospital. He graduated MB in 1923, taking the DPH in 1924 and the MD and MRCP three years later.

From 1923 until the outbreak of war he was assistant pathologist and bacteriologist to the Middlesex Hospital, and he served also, for some years, as pathologist to the Hampstead Hospital for Children. He was one of the team who in 1929, under Lord Dawson's leadership, attended King George V during his grave illness, and he was afterwards appointed CVO. In 1933 he was elected FRCP. Turning his attention to chemotherapy, he was among the first in this country to make experimental studies of, sulphonamides, and in 1938 in our columns he demonstrated that sulphapyridine is valuable against pneumococcal infections. This and other work was summarised in his Bradshaw lecture to the Royal College of Physicians in the same year (*Lancet*, 1938, ii, 1095). In the following year the Royal College of Surgeons awarded him their triennial John Hunter medal and prize for his " research work in bacteriology with special reference to the sulphonamide compounds." He attended Mr. Winston Churchill during his illnesses in 1943 and 1944. His *Medical Bacteriology* is now in its fourth edition, and *Disorders of the Blood*, of which he is joint author, is in its fifth edition.

During this war Brigadier Whitby has been in charge of the Army Blood Supply Depot at Bristol, where blood and blood substitutes are produced and where large numbers of Service officers—British, Dominion, and Allied—have been trained in their use. In this capacity and as Consulting Physician in Blood-Transfusion and Resuscitation to the Army, he has taken a large part in the development of blood-transfusion in the field. He received a knighthood in the last New Year's Honours for his work on the sulphonamide drugs. Soon afterwards he was elected honorary fellow of Downing College, Cambridge, and in May the Royal Society of Medicine awarded him their gold medal for 1944–45 for his " work in relation to the problems of wound shock and the transfusion of blood and the blood derivatives."

British Association of Physical Medicine

A meeting will be held on Wednesday, Oct. 24, at 5 PM, at 11, Chandos Street, London, W1, when Dr. James MacDonnell will read a paper on sleep posture—its implications.

Course for Primary Fellowship

Beginning on Nov. 5, the Middlesex Hospital medical school will hold a course of instruction for postgraduates intending to sit for the primary FRCS examination. Candidates will be required to take the whole course, and will not be admitted to parts of it. The fee is 25 guineas.

A History of Anæsthesia

As the first of its post-war series of research studies in the history of medicine the Wellcome Historical Medical Museum has arranged with the Oxford University Press to publish the *Development of Inhalation Anæsthesia from 1846 to 1900* by Mrs. Barbara Duncum, D PHIL. Dr. Duncum, who is now working at the Nuffield department of anæsthetics in the University of Oxford, was formerly a member of the staff of the museum.

Doctors in Parliament

Mr. Somerville Hastings has been elected chairman, and Dr. Haden Guest secretary, of the Labour Medical Committee which has been set up in the House of Commons. The re-establishment of the all-party Parliamentary Medical Group will probably be raised after Parliament has reassembled.

Cancer Act 1939

The Minister of Health (Circular 150/45) does not consider that the end of the war has yet relieved the emergency conditions which have prevented the formulation of arrangements under this Act by local authorities. He is therefore extending the period during which plans may be submitted until March 31, 1947.

Salts of Quinine for Cardiac Arrhythmias

Quinidine, the recognised remedy for cardiac arrhythmias, is almost unobtainable, and in spite of the ending of the war with Japan it is certain that no larger quantity will be available for at least a year. Salts of quinine have been used in the treatment of cardiac arrhythmias, without notable success. Since it is impossible to get quinidine, or any recognised alternative, the Medical Research Council suggest that cardiologists who wish to do so might give further trial to the use of salts of quinine. The Ministry of Supply have agreed to the use of quinine for this purpose.

Post Office Medical Department

Dr. C. G. ROBERTS, second medical officer of the Post Office, has been appointed chief medical officer in succession to the late Dr. W. L. Scott. Dr. M. C. W. LONG, assistant medical officer, becomes second medical officer.

Food Education Society

Dame Louise McIlroy, FRCOG, will give a public lecture, on food and maternal morbidity and mortality, on Oct. 15, at 2.30 PM, at London School of Hygiene, Keppel Street, WC1.

CORRIGENDUM.—Lieut.-Colonel J. N. Morris writes from India to point out two errors made in the publication of his article, The Health of Four Hundred Millions (*Lancet*, June 16, p. 743). A footnote on p. 747 should have read " In 1941 central governmental expenditure on health amounted to less than ½*d*. per head of population," (not 2*d*. per head, as printed) ; and the reference to the legend of fig. 8 should be 53, not 50.

Appointments

ANDERSON, F. A., MD DUBL. : ophthalmic specialist medical referee for the county-court districts of Brecknock, Bridgnorth, Craven Arms, Ludlow, Madeley, Oswestry and Llanfyllin, Shrewsbury, Wellington, Welshpool, Whitchurch, Builth, Knighton, Llandrindod Wells, Llanidloes, Machynlleth, Newtown (circuit No. 28).

HUGHES, R. G., MB : registrar to the throat, nose, and ear department, Royal Victoria Infirmary.

KEERS, R. Y., MD EDIN., MRCPE, FRFPS : medical director, Red Cross sanatoriums at Tor-na-Dee and Glen o'Dee.

LEWIS, C. L., MB LEEDS : registrar to the radiotherapeutic centre, Addenbrooke's Hospital, Cambridge.

ORR, H. CAMPBELL, MB GLASG., FRFPS : ophthalmic specialist medical referee for the county-court districts of Birmingham (circuit No. 21) and Dudley, Walsall, West Bromwich and Wolverhampton (circuit no. 25).

The following factory inspectors have been appointed :

MUIR, H. B., MB GLASG. : Auchtermuchty, Fife.
SPOOR, W. H., MA CAMB., MRCS : St. Germans, Cornwall.
WELLS, W. E., MB CAMB. : Bilston, Staffs.

Births, Marriages, and Deaths

BIRTHS

CHALMERS.—On Aug. 26, at Inverness, the wife of Dr. Kenneth Chalmers—a daughter.

CURWEN.—On Aug. 1, at Salisbury, the wife of Lieut.-Colonel Sydney Curwen, RAMC—a son.

HOWELLS.—On Aug. 25, at Leeds, the wife of Capt. Gwyn Howells, RAMC—a son.

MCGOWAN.—On Aug. 27, in Calcutta, the wife of Major G. K. McGowan, RAMC—a son.

MACKAY-DICK.—On Aug. 24, at Cheltenham, the wife of Major John Mackay-Dick, RAMC—a son.

MAYON-WHITE.—On Aug. 25, the wife of Dr. Richard Mayon-White of Pulborough—a daughter.

MILLS.—On Aug. 26, at Oxford, the wife of Major W. G. Q. Mills, RAMC—a son.

SMILEY.—On Aug. 27, at Chesham Bois, Bucks, the wife of Major W. Kennedy Smiley, RAMC—a son.

SPENCER.—On Aug. 24, at Newcastle-on-Tyne, the wife of Lieutenant Seymour J. G. Spencer, RAMC—a daughter.

MARRIAGES

LEIGH—WYBURN-MASON.—On Aug. 23, in London, David Leigh, BM, to Rosemary Eleanor Wyburn-Mason.

DEATHS

BARRETT.—On Aug. 29, Sidney Edward Barrett, MB CAMB., of Tillingham, Essex, aged 84.

CANE.—On Aug. 29, at Reading, Lionel Charles William Cane, MRCS.

CARRELL.—On Aug. 28, at Kingswood, Surrey, George Northen Piccaver Carrell, MRCS, aged 89.

FAIRWEATHER.—On Aug. 30, at Pocklington, East Yorks, Alexander Ferrier Angus Fairweather, MD ABERD., aged 72.

LOWE.—On Aug. 29, at Southbourne, Hants, Arthur Hamilton Lowe, MB EDIN., DPH, aged 75.

MATHESON.—On Aug. 30, at Plockton, Ross-shire, John Matheson, MB ABERD., formerly of Blackheath, London, aged 82.

PEARSE.—On July 20, Albert Pearse, MRCS, DPH, DTM & H, major RAMC retd, aged 79.

REEVES.—On Aug. 28, in London, John Kingham Reeves, BA OXFD, MRCS, aged 85.

WHITE.—On Aug. 27, at Bury, Sussex, Cresswell Fitzherbert White, MB ABERD., aged 84.

HASTENING THE DAY OF *Recovery*

FOR THE CONVALESCENT, calm, restful nights, together with pleasant cheerful days, may hasten the day of recovery. Bedtime sedation with 'SECONAL' encourages wholesome, natural rest. 'Seconal' acts promptly, carrying the patient over the threshold of sleep. It is then destroyed rapidly in the body and the effect is completely dissipated within six to eight hours. The patient awakens in the morning, fully refreshed, ready to enjoy visits from considerate relatives and friends

ELI LILLY & COMPANY LIMITED
BASINGSTOKE and LONDON

ANACARDONE
Trade Mark
Nikethamide B.D.H.

The inclusion of a monograph on nikethamide in the B.P. may be taken as an indication of the recognised importance of this 'analeptic'.
The B.D.H. preparation of nikethamide conforms with all the specifications for this substance in the B.P. It is issued under the name Anacardone in solution in ampoules (Injection of Nikethamide B.P.) or in a flavoured 25 per cent. solution for oral administration.
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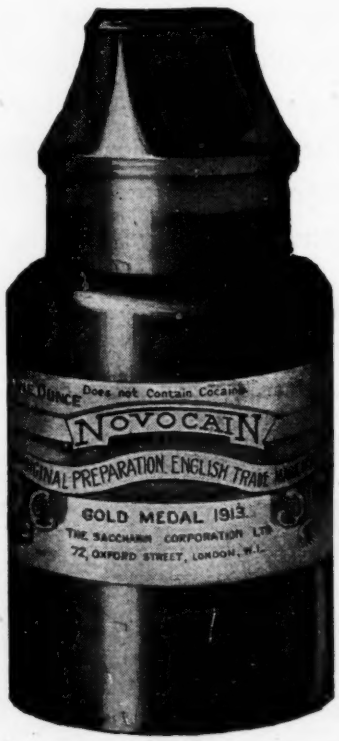

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† "The Treatment of Wounds in War Time." *Medical Press & Circular*, January 13th, 1943.

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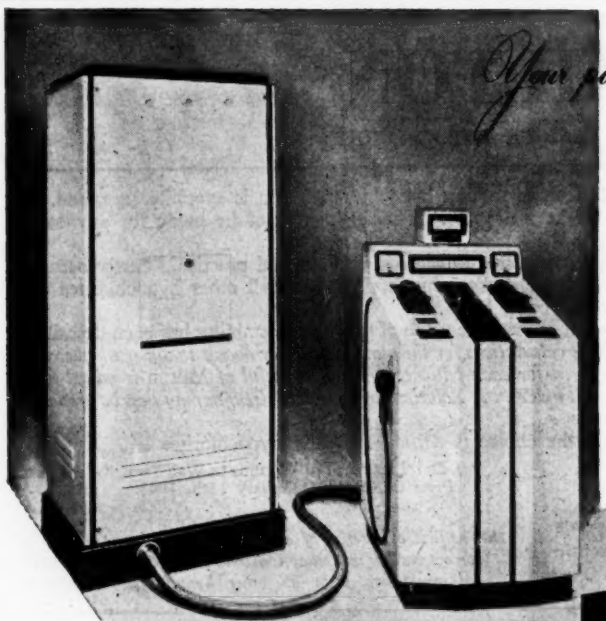

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Two miles from the Main Hospital there are several branch establishments and villas situated in a park and farm of 650 acres. Milk, meat, fruit, and vegetables are supplied to the Hospital from the farm, gardens, and orchards of Moulton Park. Occupational therapy is a feature of this branch, and patients are given every facility for occupying themselves in farming, gardening, and fruit growing.

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The seaside house of St. Andrew's Hospital is beautifully situated in a Park of 330 acres, at Llanfairfechan, amidst the finest scenery in North Wales. On the North-West side of the Estate a mile of sea coast forms the boundary. Patients may visit this branch for a short seaside change or for longer periods. The Hospital has its own private bathing house on the seashore. There is trout-fishing in the park.

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For terms and further particulars apply to the Medical Superintendent (TELEPHONE: No. 2356 and 2357 Northampton), who can be seen in London by appointment.

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Telegrams: "PSYCHOLIA, LONDON" — FOR THE TREATMENT OF MENTAL DISORDERS — *Telephone:* RODNEY 4242 (2 lines)

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For the reception and treatment of PRIVATE PATIENTS of both sexes of the UPPER AND MIDDLE CLASSES suffering from Mental and Nervous Disorders, Alcoholism and Drug Addiction, either voluntarily, temporarily, or under certificate. Patients are classified in separate buildings according to their mental condition. Situated in park and grounds of 400 acres. Self-supported by its own farm and gardens in which patients are encouraged to occupy themselves. Every facility for indoor and outdoor recreation. For terms, prospectus, etc., apply MEDICAL SUPERINTENDENT. *Telephone:* Ashton-in-Makerfield 7311. *Telegraphic Address:* Wootton, Ashton-in-Makerfield.

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FINAL EXAMINATION: SURGERY, 12th November, 10th December, 1945, 14th January, 1946. MEDICINE, PATHOLOGY, 19th November, 17th December, 1945, 21st January, 1946. MIDWIFERY, 20th November, 18th December, 1945, 22nd January, 1946. MASTERY OF MIDWIFERY EXAMINATIONS, May and November.

For regulations apply REGISTRAR, Apothecaries' Hall, Black Friars-lane, London, E.C.4.

THE MIDDLESEX HOSPITAL MEDICAL SCHOOL has decided to resume their Annual Dinner for past and present students, which was so successful before the war, and arrangements have been made to hold the Dinner this year on 28th September, 7 for 7.30 P.M., at the Savoy Hotel. The Dean suggests that early application for places should be made to the Medical School Secretary, in order to assist him in making the necessary arrangements, as the number of seats is limited. Tickets will cost 22s. 6d. (exclusive of wine).

ST. GEORGE'S HOSPITAL, S.W.1.

DEPARTMENT OF RADIOTHERAPY.

The Committee of St. George's Hospital, Hyde Park Corner, London, S.W.1, regret that, pending the rebuilding of the Hospital, it is necessary, owing to lack of accommodation, to close the Radiotherapy Department on the 31st December next, and that new patients for treatment in that Department cannot be accepted after the 1st November, 1945.

WILLIAM E. HALL, Secretary and Accountant.

ROYAL COLLEGE OF SURGEONS OF ENGLAND.

ELECTION TO THE COURT OF EXAMINERS.

Notice is hereby given that the Council, on the 13th December, 1945, will elect a Member of the Court of Examiners. Mr. W. H. C. Romanis, the retiring Examiner, is eligible and offers himself for re-election.

Fellows of the College desirous of becoming candidates for the office must make application to the Secretary on or before Monday, 1st October, 1945. KENNEDY CASSELS, Secretary.

Lincoln's Inn-fields, W.C.2, 8th September, 1945.

GUY'S HOSPITAL MEDICAL SCHOOL.

FINAL F.R.C.S. COURSE.

A short intensified course of instruction extending over a period of 5 weeks in preparation for the final F.R.C.S. examination to be held in November, 1945, will commence on Monday, 24th September. The fee for the course is 18 guineas.

Vacancies are limited and applications should be made immediately to the Dean, Guy's Hospital Medical School, London Bridge, S.E.1.

CENTRAL LONDON OPHTHALMIC HOSPITAL, Judd-street, London, W.C.1. Applications are invited from registered practitioners, including R practitioners who now hold A posts, for the position of JUNIOR HOUSE SURGEON (B2). Salary £150 p.a., with full residential emoluments. The appointment is for 6 months in the first instance.

Applications should be sent to the undersigned not later than 20th September. The successful applicant must be a member of a Medical Defence Society. W. MERRILL, Secretary.

THE ROYAL CANCER HOSPITAL (FREE) (Incorporated under Royal Charter), Fulham-road, London, S.W.3. Applications are invited from registered medical practitioners, including R practitioners who now hold A posts, for the appointment of HOUSE SURGEON (B2), to commence duties on the 1st October, 1945. The appointment is for 6 months and subject to rules, a copy of which can be obtained from the Secretary. Salary £200 p.a., with full residential emoluments.

Applications, to be made on a form which will be supplied by the Secretary, with copies only of not more than 3 recent testimonials, to be sent not later than the first post on Wednesday, 12th September, 1945, to: VICTOR H. PINKHAM, Secretary.

COUNTY BOROUGH OF WEST HAM. Whipps Cross Hospital, LEYTONSTONE, E.11 (1300 Beds). The Council invite applications from registered medical practitioners, including those serving in H.M. Forces, for the post of MEDICAL SUPERINTENDENT of the above General Hospital. In accordance with the Council's resolution the post will be designated temporary until the conclusion of the war, but if satisfactory service has been given the post will be made permanent. The consent of the Minister of Health has been obtained to the making of the appointment. The salary for the post is £1100 p.a., together with a house valued for superannuation purposes at £100 p.a. On the publication of the revised "Askwith Scale" the Council will amend the salary in accordance with that scale. Candidates must have had both wide clinical and administrative experience, and the possession of higher degrees will be considered an advantage. Preference will be given to candidates who have held already the post of Medical Superintendent to a general hospital. The appointment will be subject to the Council's regulations as made from time to time regarding holidays, sick pay, &c., and the successful candidate will be required to pass a medical examination.

Forms upon which application must be made can be obtained from the Medical Officer of Health, 223/225, Romford-road, West Ham, E.7, on receipt of a stamped addressed envelope, and returned to him not later than 8th October, 1945.

Canvassing members of the Council is prohibited and will disqualify.

CHARLES E. CRANFIELD, Town Clerk.

Town Hall, West Ham, E.15.

LONDON COUNTY COUNCIL. Consultant and Specialist SERVICES. Applications are invited for appointment to the position of Temporary Part-time CONSULTANT ALLERGIST for service as required in the Council's general and special hospitals. Fees 2½ guineas a session of approximately 2½ hours' duration (5 guineas a session or 7½ guineas for 2 sessions on the same day at certain hospitals on the London outskirts or outside the County of London).

Application forms, containing further particulars of duties and conditions of service, obtainable (stamped addressed foolscap envelope necessary) from the Medical Officer of Health (S.D.6), County Hall, London, S.E.1, returnable by 28th September, 1945. Canvassing disqualifies.

LONDON JEWISH HOSPITAL, Stepney Green, E.1. (E.M.S. Sector II.) Applications are invited from registered medical practitioners, Male and Female, for the appointment of RESIDENT HOUSE OFFICER (A) (duties of House Physician, House Surgeon, and Casualty Officer), now vacant. Salary is at the rate of £150 p.a., with full residential emoluments. Practitioners within 3 months of qualification and liable under the National Service Acts may apply, when the appointment will be for a period of 6 months; otherwise a period of at least 6 months.

Applications to the Secretary.

MIDDLESEX COUNTY COUNCIL. Temporary Assistant MEDICAL OFFICER (B1, Male) required at Napsbury Mental Hospital, near St. Albans, Herts. Salary £440–£510 p.a., plus war bonus according to qualifications and experience, with board, lodging, laundry, and attendance. In addition £50 p.a. is paid for D.P.M. Suitably qualified R practitioners holding B2 appointments, also those holding B1 and rejected by the R.A.M.C., may apply.

Applications to the Medical Superintendent, "B3."

C. W. RADCLIFFE, Clerk of the County Council.

Middlesex Guildhall, Westminster, S.W.1.

DREADNOUGHT SEAMEN'S HOSPITAL, Greenwich. Applications are invited for the post of TEMPORARY WAR-TIME CLINICAL ASSISTANT for E.N.T. Department. 1 weekly session at the rate of 2 guineas per session.

Applications, with copies of recent testimonials, to be sent to—

F. A. LYON, Administrator and Secretary.

CHARING CROSS HOSPITAL. The Council invite applications for the post of PHYSICIAN to the Children's Department.

Candidates, who must be Members of the Royal College of Physicians of London, should send in their applications, together with copies of 3 recent testimonials, not later than Tuesday, 1st January, 1946, to—

GEORGE J. JONES, Secretary.

Charing Cross Hospital.

LONDON CHEST HOSPITAL, Victoria Park, E.2. House PHYSICIAN (B2) (Male or Female) required on 1st November, 6 months' appointment. Salary at the rate of £150 p.a., board, residence, and laundry provided. R practitioners who now hold A posts may apply.

Applications, with copies of 3 recent testimonials, should be sent by 26th September to the Secretary.

LONDON CHEST HOSPITAL, Victoria Park, E.2. House SURGEON (B2), Male or Female, required 1st November, with previous surgical experience, preferably thoracic. Salary £150 p.a., with full residential emoluments. R practitioners who now hold A posts may apply, when appointment will be limited to 6 months.

Applications, with copies of 3 recent testimonials, should be sent by 26th September to the Secretary.

GERMAN HOSPITAL, Ritson-road, Dalston, London, E.8. (British Voluntary Hospital under E.M.S. Scheme.) HOUSE SURGEON (B2), with some practical experience, wanted. Commencing salary £200 p.a., or more according to experience, with full board and residence. R practitioners holding A posts may apply, when appointment will be limited to 6 months.

Please apply, with copies of testimonials, to the Secretary.

CITY OF MANCHESTER. Public Health Department. Booth HALL HOSPITAL FOR SICK CHILDREN. (760 Beds.) The Corporation invites applications for the appointment of TEMPORARY VISITING EAR, NOSE, AND THROAT SURGEON (part-time) at Booth Hall Hospital, Blackley, Manchester, 9, in connexion with the scheme of operative treatment of tonsils and adenoids in school-children. The salary for the appointment will be at the rate of £125 p.a. in respect of 1 weekly session.

Forms of application may be obtained from the Medical Officer of Health, Hospitals Administration Section, P.O. Box 399, Town Hall, Manchester, 2, by whom all applications must be received on or before 26th September, 1945. Canvassing in any form, oral or written, direct or indirect, is prohibited.

PHILIP B. DINGLE, Town Clerk.

Town Hall, Manchester, 2, 29th August, 1945.

CITY OF MANCHESTER. Public Health Department. Applications are invited for the position of ASSISTANT TUBERCULOSIS OFFICER (temporary). Candidates must be registered medical practitioners having special knowledge of medical and surgical tuberculosis and should state whether they possess the Diploma in Public Health. The commencing basic salary is £675 p.a., but 3 annual increments of £25 may be granted at the discretion of the Council. A temporary cost-of-living award, which at the present time is £60 p.a., is payable in addition to the foregoing salary. The appointment is subject to the Manchester Corporation conditions of service. The consent of the Minister of Health has been obtained to the making of this appointment. Although the vacancy is on the permanent assignment of staff, the appointment will be temporary for the time being and subsequently the officer appointed will be eligible to apply for the permanent post. Attention is drawn to Ministry of Health Circulars 2818 and 2881, which require that whole-time Public Health Officers who are of military age must, before applying for any other post, first obtain the prior permission of the Minister of Health.

Applications (no special form is issued), stating age, qualifications, and experience, with copies of not more than 3 recent testimonials, and endorsed on the envelope "Assistant Tuberculosis Officer," must be addressed to the Medical Officer of Health, Town Hall, Manchester, 2, and not to members of the Committee or Council, and must be received by him not later than 29th September, 1945. The gentleman appointed will be under the administrative control of the Medical Officer of Health, and the immediate control of the Senior Tuberculosis Officer. He will be required to devote the whole of his time to the duties of his position, to execute the Deed of Service, to contribute to the Corporation Superannuation Fund, and if under the age of 30 to the Widows and Orphans Pensions Scheme. Canvassing in any form, oral or written, direct or indirect, is prohibited.

PHILIP B. DINGLE, Town Clerk.

Town Hall, Manchester, 2, 29th August, 1945.

THE NATIONAL UNIVERSITY OF IRELAND APPOINTMENTS COMMITTEE can recommend a limited number of suitably qualified Medical Graduates as Locum Tenentes, Assistants, or House Surgeons.

Medical men or hospitals who require such services should apply, giving full particulars, to the Secretary, Appointments Committee, N.U.I., 86, St. Stephen's Green, Dublin. Telephone 51793.

GLASGOW ROYAL INFIRMARY. Applications are invited from registered medical practitioners for the post of RESIDENT MEDICAL OFFICER (B1) (full-time) at Canniesburn Auxiliary Hospital. Applicants with previous hospital resident experience preferred. Salary £200 p.a., with board, lodging, and laundry. Suitably qualified R practitioners holding B2 or B1 appointments are invited to apply, but they must have obtained the sanction of the Scottish Central Medical War Committee to their application. Particulars as to duties, &c., may be obtained from the Superintendent, Glasgow Royal Infirmary, 84, Castle-street, Glasgow, C.4.

Applications, stating age, qualifications, and experience, with 3 names for reference, to be lodged with the undersigned. No canvassing.

R. MORRISON SMITH, C.A., F.H.A.,
Glasgow Royal Infirmary, Secretary and Cashier.
Office: 135, Buchanan-street, Glasgow, C.1.

ROYAL SUSSEX COUNTY HOSPITAL, Brighton. (376 Beds.) Applications are invited from registered medical practitioners (Male or Female) for the post of CASUALTY HOUSE SURGEON (A), vacant 7th November next. The salary attached to the post is £175 p.a., with full residential emoluments. Practitioners within 3 months of qualification and liable under the National Service Acts may apply, when the appointment will be for a period of 6 months.

Applications should be sent to the Secretary-Superintendent.

ROYAL SUSSEX COUNTY HOSPITAL, Brighton. Applications are invited from registered medical practitioners (Male or Female) for the appointment of HOUSE PHYSICIAN (B2), vacant 20th October next. The salary is at the rate of £200 p.a., with full residential emoluments. R practitioners who now hold A posts may apply, when appointment will be limited to 6 months; otherwise may be extended.

Applications to—

L. L. W. LANCASTER-GAYE, Secretary-Superintendent.

COUNTY BOROUGH OF IPSWICH. Borough General Hospital. Applications are invited from registered medical practitioners, Male and Female, for the appointment of RESIDENT ASSISTANT MEDICAL OFFICER (B1). Applicants should have held house appointments and had medical experience. Salary at the rate of £350 p.a., plus full residential emoluments. Suitably qualified R practitioners holding B2 appointments, also those holding B1 and rejected by the R.A.M.C., may apply.

Applications to the Medical Officer of Health, Public Health Department, Elm-street, Ipswich.

SURREY COUNTY COUNCIL. St. Helier County Hospital, CARSHALTON. Applications are invited from registered medical practitioners, Male and Female, for the appointment of HOUSE SURGEON (A). Salary is at the rate of £120 p.a., plus full residential emoluments. Practitioners within 3 months of qualification and liable under the National Service Acts may apply, when the appointment will be for a period of 6 months; otherwise a period not exceeding 1 year.

Apply to the Medical Superintendent.

SURREY COUNTY COUNCIL. St. Helier County Hospital, CARSHALTON. (862 Beds.) Applications are invited from registered medical practitioners, Male or Female, for the appointment of CASUALTY OFFICER (B2). Previous experience in E.N.T. work desirable. Salary is at the rate of £250 p.a., plus war bonus, plus full residential emoluments. R practitioners who now hold A posts may apply, when the appointment will be limited to 6 months; otherwise will not exceed 1 year.

Apply to the Medical Superintendent.

CITY OF COVENTRY. Gulson-road Municipal General Hospital, Gulson-road, COVENTRY. Applications are invited from Male registered medical practitioners, including practitioners within 3 months of qualification and liable under the National Service Acts, for the appointment of JUNIOR ASSISTANT RESIDENT MEDICAL OFFICER (A) at the above Hospital. The post will be for a period of 6 months, but terminable at any time by 1 month's notice. Salary will be at the rate of £250 p.a., plus war bonus and full residential emoluments.

Applications should be made at once to—

A. MASSEY, Medical Officer of Health.

The Council House, Coventry, 1st September, 1945.

HIGH WYCOMBE AND DISTRICT WAR MEMORIAL HOSPITAL. (100 Beds.) Applications are invited from registered medical practitioners, including R practitioners holding A posts, for the appointment of RESIDENT MEDICAL OFFICER (B2), vacant 1st October, 1945. Salary at rate of £200 p.a., plus residence and board. The appointment is for 6 months.

Applications with details to: E. BARBER, Secretary.

HIGH WYCOMBE AND DISTRICT WAR MEMORIAL HOSPITAL. (100 Beds.) The Management Committee invites applications for the appointment of HONORARY CONSULTING GYNÆCOLOGIST.

Applications, to be forwarded to the undersigned not later than 25th October, should state qualifications and experience.

E. BARBER, Secretary.

SCUNTHORPE AND DISTRICT WAR MEMORIAL HOSPITAL, SCUNTHORPE, LINCS. (234 Beds.) Applications are invited from registered medical practitioners, Male or Female, for the appointment of 2 HOUSE OFFICERS (A), now vacant. Salary is at the rate of £275 p.a., with full residential emoluments. Practitioners within 3 months of qualification and liable under the National Service Acts may apply, when appointment will be for a period of 6 months.

S. LORD, Secretary-Superintendent.

THE GUEST HOSPITAL, Dudley. (The Resident Staff consists of a Resident Surgical Officer and 3 House Surgeons.) Applications are invited from registered medical practitioners, Male and Female, for the appointment of HOUSE SURGEON (B2), now vacant. Salary at the rate of £200 p.a., with full residential emoluments. R practitioners who now hold A posts may apply, when the appointment will be limited to 6 months.

H. RAYMOND HURST,
31st August, 1945. House Governor and Secretary.

HULL ROYAL INFIRMARY. Applications are invited for the post of ORTHOPÆDIC HOUSE SURGEON (B2). Salary £200 p.a., with full residential emoluments. R practitioners who now hold A posts may apply, when the appointment will be limited to 6 months.

Applications to: R. J. CARLESS, House Governor.

ROYAL VICTORIA HOSPITAL, Dover. (65 Beds.) Applications are invited from registered medical practitioners, Male or Female, including practitioners within 3 months of qualification and liable under the National Service Acts, for the appointment of HOUSE SURGEON (A). Salary at rate of £200 p.a., with full residential emoluments. The appointment will be for a period of 6 months.

Applications, stating age, qualifications, and nationality, together with copies of 3 recent testimonials, to be sent to the Secretary.

LANCASHIRE COUNTY COUNCIL. Jericho Hospital, Bury. Applications are invited from registered medical practitioners for the appointment of RESIDENT MEDICAL OFFICER (B1). Salary is at the rate of £350 p.a., together with a cost-of-living bonus and the usual residential emoluments. The appointment is subject to medical examination and is superannuable. Suitably qualified R practitioners holding B2 appointments, also those holding B1 and rejected by the R.A.M.C., may apply.

Forms of application from the County Medical Officer of Health, Hospital and Medical Department, County Offices, Preston, to whom all applications must be forwarded to arrive not later than Monday, the 17th September, 1945.

R. H. ABCOCK, Clerk of the County Council.

County Offices, Preston, 31st August, 1945.

LANCASHIRE COUNTY COUNCIL. Lake Hospital, and DARNTON HOUSE, ASHTON-UNDER-LYNE. Applications are invited from registered medical practitioners (Male or Female) for the appointment of RESIDENT MEDICAL OFFICER (B2). Salary is at the rate of £250 p.a., together with the usual residential emoluments. R practitioners who now hold A posts may apply, when the appointment will be limited to 6 months; otherwise may be renewed for a further period of 6 months.

Forms of application from the County Medical Officer of Health, Hospital and Medical Department, County Offices, Preston, to whom all applications must be forwarded to arrive not later than Monday, the 17th September, 1945.

R. H. ABCOCK, Clerk of the County Council.

County Offices, Preston, 31st August, 1945.

ROYAL SHEFFIELD INFIRMARY AND HOSPITAL. Applications are invited from registered medical practitioners, including Medical Officers recently demobilised from H.M. Forces, for the appointment (B1) of FIRST ASSISTANT to the Ophthalmic Department, Royal Infirmary Unit, vacant November. Salary is at the rate of £650 p.a., non-resident. Suitably qualified R practitioners now holding B2 posts, also those holding B1 and rejected by the R.A.M.C., may apply.

Applications should reach the undersigned not later than 10th September, 1945. P. N. GLASS, General Superintendent.

Royal Infirmary, Sheffield, 6, 1st September, 1945.

CITY AND COUNTY OF BRISTOL. Department of Public Health. Applications are invited from registered medical practitioners, Male or Female, for the immediate appointment of ASSISTANT RESIDENT MEDICAL OFFICER (B2), at Ham Green Hospital. Salary £200 p.a., plus full residential emoluments. R practitioners who now hold A posts may apply, when the appointment will be limited to 6 months; otherwise for a period of 1 year.

Application forms may be obtained from the undersigned, to whom they must be returned, accompanied by copies of not more than 3 recent testimonials, forthwith.

R. H. PARRY, Medical Officer of Health.

Kenwith Lodge, Westbury Park, Bristol, 6.

WORCESTER ROYAL INFIRMARY. Applications are invited for the position of HOUSE SURGEON (A). The salary will be at the rate of £120 a year, with full residential emoluments. Practitioners within 3 months of qualification and liable under the National Service Acts may apply, when the appointment will be for 6 months.

Applications, with copies of not more than 3 testimonials, should be addressed to—

HAROLD WIGG, Acting Superintendent-Secretary.

ROYAL ALBERT EDWARD INFIRMARY AND DISPENSARY, WIGAN. Applications are invited from registered medical practitioners for the appointment of HOUSE SURGEON (B2), Male, vacant 1st October, 1945. Salary £175 p.a., with full residential emoluments. R practitioners who now hold A posts may apply, when appointment will be limited to 6 months; otherwise may be extended for a further period.

Applications, stating age, qualifications with dates, and nationality, and accompanied by copies of 3 recent testimonials, should be sent as soon as possible to—

A. STANLEY BRUNT, General Superintendent and Secretary.

CITY OF BIRMINGHAM MENTAL HOSPITAL, Winson Green, BIRMINGHAM, 18. Applications are invited, Male or Female, for the post of TEMPORARY RESIDENT ASSISTANT MEDICAL OFFICER (B1). Salary £350, rising by annual increments to £450, with full residential emoluments, plus £50 for the D.P.M. and war bonus (£39 4s. 8d. male; £35 11s. 11d. female). Suitably qualified R practitioners holding B2 appointments, also those holding B1 and rejected by the R.A.M.C., may apply.

Applications, with testimonials, to be sent to the Medical Superintendent by 22nd September, 1945.

PRISON SERVICE. Medical Staff. Applications are invited for the post of Part-time Woman MEDICAL OFFICER at H.M. Prison, Birmingham, to assist the other Medical Officers. Salary is £250 p.a., plus a temporary war bonus of (at present) £20 16s. p.a. The post is unestablished.

Forms of application and further particulars may be obtained from the Prison Commission (Establishment Branch), Kensington Mansions, Trebovir-road, Earls Court, London, S.W.5.

SURREY COUNTY COUNCIL. Farnham County Hospital, Hale-road, FARNHAM. (230 Beds.) Applications are invited from registered medical practitioners for the appointment of RESIDENT ASSISTANT MEDICAL OFFICER (B1) to the above General Hospital. Applicants must have had previous surgical experience, preferably including orthopædic work. The appointment will be on the Council's temporary staff and subject to 1 month's notice on either side, but any Local Government Superannuation rights will be preserved. Salary at the rate of £550 p.a., plus war bonus, plus full residential emoluments. Suitably qualified R practitioners holding B2 appointments, also those holding B1 and rejected by the R.A.M.C., may apply.

Apply to the Medical Superintendent by 20th September, 1945.

EAST SURREY HOSPITAL, Redhill, Surrey. Applications are invited from registered medical practitioners, Male or Female, for the appointment of HOUSE SURGEON (A), vacant 24th September. Salary £150 p.a., with full residential emoluments. Practitioners within 3 months of qualification and liable under the National Service Acts may apply, when the appointment will be for 6 months only.

Applications to be sent to: E. C. AYLING, Secretary.

ADMINISTRATIVE COUNTY OF ESSEX. Medical Staff. The County Council invite applications for the appointment at the Oldchurch County Hospital, Romford, of TEMPORARY RESIDENT JUNIOR ASSISTANT MEDICAL OFFICER (B2). Salary £200 a year, plus residential emoluments valued at £160 a year. Details of duties can be obtained from the Medical Superintendent of the Hospital. R practitioners now holding A posts may apply, when the appointment will be limited to 6 months; otherwise a period of 1 year.

All applications, which must contain full information as to the applicant's position in relation to military service, should be addressed to Mr. G. E. Pegram, Administrative Offices, Laurie-square, Romford.

JOHN E. LIGHTBURN, Clerk of the County Council.

County Hall, Chelmsford, 27th August, 1945.

CHELMSFORD AND ESSEX HOSPITAL, London-road, Chelmsford, ESSEX. (186 Beds.) Applications are invited from registered medical practitioners, Male or Female, for the post of HOUSE SURGEON (A), to commence immediately. Salary £175 p.a., plus board, lodging, and laundry. Practitioners within 3 months of qualification and liable under the National Service Acts may apply, when appointment will be for 6 months.

Apply, with recent testimonials, to—

R. G. MORRISH, House Governor and Secretary.

ABERDEEN MATERNITY HOSPITAL. Applications are invited from registered medical practitioners (Male or Female), including R practitioners who now hold A posts, for 2 appointments of RESIDENT HOUSE SURGEONS (B2), vacant 5th October, 1945. The appointments will be limited to 6 months. The salary is at the rate of £75 p.a. if no previous experience, £100 p.a. with previous experience, with full residential emoluments. R practitioners must have obtained the sanction of the Scottish Central Medical War Committee to their application.

Applications, stating age, qualifications with dates, nationality, and present post, and accompanied by copies of 3 recent testimonials, should be sent not later than 22nd September to—8, Golden-square, Aberdeen. WATT & CUMINE, Secretaries.

EAST SUSSEX COUNTY COUNCIL. Applications are invited for the post of Temporary Whole-time PSYCHIATRIST or Temporary Part-time PSYCHIATRIST or PSYCHIATRISTS for approximately 6 sessions weekly in connexion with the Joint Child Guidance Service. Salary for whole-time appointment £750 to £1100 by annual increments of £25. Commencing salary may include 1 or more increments according to experience. There will be a cost-of-living bonus in addition. Travelling expenses by motor-car and subsistence allowance will be paid on the County scale. The whole-time appointment will be subject to the Local Government Superannuation Act, 1937, and to 1 month's notice on either side, and will be subject to such conditions of service as may be approved from time to time by the County Council. Fees for part-time appointment, £3 3s. per session, with travelling expenses.

Application forms, obtainable from County Medical Officer of Health, County Hall, Lewes, should be submitted to him as soon as possible. H. S. MARTIN, Clerk of the County Council.

County Hall, Lewes, August, 1945.

CITY OF EDINBURGH. Public Health Department. Applications are invited for the position of JUNIOR MEDICAL OFFICER to serve in the Mass Radiography Unit of the Corporation. Candidates should preferably have had experience in mass radiography and/or in a tuberculosis department or sanatorium. By agreement with the Department of Health the appointment in the first instance will be on a temporary basis. Salary scale £500–£25–£700, plus war bonus at present amounting to £60 p.a. Placing on the scale in relation to the candidate's experience may be given. Candidates already in the Public Health Service will require the consent of the Secretary of State in terms of D.H.S. Circular No. 65/1943. Candidates in England and Wales will require the permission of the Minister of Health.

Applications, giving age, experience, and qualifications, should be sent not later than 6th October, 1945, to the Medical Officer of Health, Johnston-terrace, Edinburgh, 1.

PONTEFRACT GENERAL INFIRMARY AND THE HYDES HOSPITAL. (112 Beds.) Applications are invited from registered medical practitioners (Male) for the appointment of HOUSE SURGEON (A), vacant immediately. Salary £150 p.a., with full residential emoluments. Practitioners within 3 months of qualification and liable under the National Service Acts may apply, when appointment will be for a period of 6 months.

Applications should be sent to—

August, 1945. D. J. RICHARDS, Secretary-Superintendent.

COUNTY BOROUGH OF NEWPORT. Social Welfare Committee. Applications are invited from registered medical practitioners, Male or Female, for the temporary appointment of JUNIOR RESIDENT MEDICAL OFFICER (A) at Woolaston House Emergency Hospital, Newport, Mon. Salary £150 p.a., with full residential emoluments. All fees, with the exception of coroners' fees, are payable to the Social Welfare Committee. Practitioners within 3 months of qualification and liable under the National Service Acts may apply, when the appointment will be for a period of 6 months; otherwise 12 months.

Applications, accompanied by copies of 2 recent testimonials, should be sent at once to: TOM KAY, Director of Social Welfare.

Town Hall, Newport, Mon, September, 1945.

GLOUCESTERSHIRE JOINT BOARD FOR TUBERCULOSIS. STANDISH HOUSE SANATORIUM, STONEHOUSE, GLOS. Applications are invited from registered medical Men or Women, including R practitioners who now hold A posts, for the post of JUNIOR ASSISTANT MEDICAL OFFICER (B2) at the above institution. No previous professional experience is necessary. There are at present 250 Beds, including men, women, and children. There is an orthopædic block. Salary £250 p.a., plus bonus, with board, furnished apartments, and laundry in addition. The appointment is for 6 months and may be terminable within that period by 1 month's notice on either side. Closing date for applications 21st September.

GUY H. DAVIS, Clerk of the Joint Board.

Shire Hall, Gloucester.

THE LAWN, Lincoln. (Registered Hospital for Mental and Nervous Diseases—100 Beds.) Applications are invited from registered medical practitioners for the appointment of ASSISTANT MEDICAL OFFICER (B2). Experience in mental work preferable but not essential. Salary £350 p.a., plus 5% war bonus, together with emoluments including board, flatlet, attendance, and laundry. R practitioners holding A posts may apply, when appointment will be limited to 6 months.

Applications, together with copies of 3 recent testimonials, should be addressed to the Chairman of Governors, The Lawn, Lincoln.

NOTTINGHAM CHILDREN'S HOSPITAL. Applications are invited from registered medical practitioners for the appointment of RESIDENT HOUSE PHYSICIAN (B1), Woman, vacant 1st November, 1945. Applicants should have held house appointments and suitably qualified W practitioners holding B2 appointments are invited to apply. Salary is at the rate of £220 p.a., with apartments, board, and laundry, and the appointment is for 6 months.

Applications, together with testimonials, stating age, nationality, qualifications, and experience, to be sent to the Honorary Secretary, 1, King John's Chambers, Nottingham, on or before 18th September, 1945. Selected candidates will be required to attend at the Hospital for a personal interview.

BRISTOL ROYAL HOSPITAL. (Incorporating the Bristol Royal INFIRMARY and BRISTOL GENERAL HOSPITAL.) Applications are invited from registered medical practitioners for the following A appointments:—

(1) HOUSE SURGEON to the E.N.T. Department.
(2) SECOND CASUALTY HOUSE SURGEON.
(3) HOUSE PHYSICIAN to Dermatological and Radiological Departments.

Salary at the rate of £80 p.a. War bonus at the rate of £20 p.a. will also be paid with full residential emoluments. Practitioners within 3 months of qualification and liable under the National Service Acts may apply, when appointments will be for a period of 6 months.

Applications to be made on application forms to be obtained from: ELLIS C. SMITH, F.C.I.S., Secretary and House Governor, Bristol Royal Infirmary.

NORTHAMPTON GENERAL HOSPITAL. (408 Beds.) Applications are invited immediately from registered medical practitioners, Male and Female, for the appointment of HOUSE SURGEON (A). Salary at rate of £150 p.a., with full residential emoluments. Practitioners within 3 months of qualification and liable under the National Service Acts may apply, when appointment will be for a period of 6 months.

Applications, stating age, qualifications, and nationality, and accompanied by copies of 3 recent testimonials, should be sent to: GORDON S. STURTRIDGE.

THE UNIVERSITY OF MANCHESTER. Applications are invited for the following posts:—

LECTURER IN NEUROSURGERY.
LECTURER IN NEUROLOGY.

Duties to commence in October, 1945, but applications will be considered from those unable to take up their duties at that date. Commencing salary £850 p.a. Applicants must have had experience commensurable with the nature of the posts and be registered practitioners. They will work in the University Departments of Neurosurgery and Neurology in the Manchester Royal Infirmary.

Applications should be sent not later than 28th September, 1945, to the Registrar, from whom further information can be obtained.

THE ROYAL INFIRMARY, Sunderland. Applications are invited for a LABORATORY TECHNICIAN at the above Hospital. Good experience in hæmatology essential. Salary in accordance with B.H.A. Scale, "B" Grade. Candidates must be members of the Institute of Medical Laboratory Technology. Applications invited from ex-Service men.

T. F. W. MACKEOWN, House Governor and Secretary.

THE ROYAL INFIRMARY, Sunderland. Applications are invited for the post of ASSISTANT PATHOLOGIST. Postgraduate experience and training in hospital pathology essential. The appointment is a full-time one and the salary is £750 p.a.

Applications to the House Governor and Secretary, from whom further particulars may be obtained.

THE ROYAL GWENT HOSPITAL, Newport, Mon. (255 Beds.) Applications are invited for the appointment of HOUSE SURGEON (A), vacant now. Salary at the rate of £175 p.a., with full residential emoluments. Practitioners within 3 months of qualification and liable under the National Service Acts may apply, when the appointment will be for a period of 6 months.

Applications, stating age, nationality, qualifications with dates, and details of previous appointments, accompanied by copies of 3 recent testimonials, should be sent immediately to—

ALAN RUDDLE, Secretary-Superintendent.

13th August, 1945.

CAMERON HOSPITAL, West Hartlepool. (86 Beds.) Applications are invited from registered medical practitioners, Male and Female, for the appointment of HOUSE SURGEON (A), duties to commence as soon as possible. Salary at the rate of £200 p.a., with full residential emoluments. Practitioners within 3 months of qualification and liable under the National Service Acts may apply, when the appointment will be for a period of 6 months.

Applications, stating age, qualifications, nationality, and experience, together with copies of 3 recent testimonials, should be sent to: Miss P. M. BETTS, Secretary.

YORK COUNTY HOSPITAL. (222 Beds.) Applications are invited from registered medical practitioners, Male or Female, for the appointment of HOUSE SURGEON (A), vacant 22nd September, 1945, whose main duties are in the Eye, Ear, Nose, and Throat Department (37 Beds, with busy Out-patient Clinics), but who will share in the general work of the Hospital; also Casualty Duty. Salary is at the rate of £175 p.a., with full residential emoluments. This post is recognised for D.O.M.S. and D.L.O. examinations. Practitioners within 3 months of qualification and liable under the National Service Acts may apply, when the appointment will be for a period of 6 months.

Applications to be sent to the undersigned immediately.

J. R. MACKRILL, Secretary.

ROYAL WEST OF ENGLAND SANATORIUM AND E.M.S. HOSPITAL, WESTON-SUPER-MARE, SOMERSET. (172 Beds.) Applications are invited from medical practitioners for the appointment of HOUSE PHYSICIAN (A), duties to commence 1st September. Salary is at the rate of £200 p.a., with full residential emoluments. Practitioners within 3 months of qualification and liable under the National Service Acts may also apply, when the appointment will be for a period of 6 months.

Applications, stating age, qualifications with dates, and nationality, and accompanied by copies of 3 recent testimonials, should be addressed to: LESLIE J. FURSLAND, Secretary.

ROTHERHAM HOSPITAL, Doncaster Gate, Rotherham, Yorks. (General Voluntary Hospital—150 Beds.) Applications are invited from registered medical practitioners (Male or Female) for the appointments of HOUSE PHYSICIAN (A) and SECOND CASUALTY OFFICER (A), now vacant. Salary in each case £225 p.a., with full residential emoluments. Practitioners within 3 months of qualification and liable under the National Service Acts may also apply, when the appointments will be for 6 months.

Applications should be sent at once to the Secretary-Superintendent.

WALSALL GENERAL HOSPITAL. (181 Beds.) Applications are invited from registered medical practitioners, Male and Female, for the appointment of CASUALTY OFFICER AND ORTHOPÆDIC HOUSE SURGEON (B2). Salary is at the rate of £200 a year, with full residential emoluments. R practitioners who now hold A posts may apply, when the appointment will be limited to 6 months.

Applications, stating age, qualifications with dates, and nationality, and accompanied by copies of 3 recent testimonials, should be forwarded immediately to—

W. H. HARPER, Honorary House Governor.

ROYAL HALIFAX INFIRMARY. (Class Ia, E.M.S.) (250 Beds.) Applications are invited for the post of RESIDENT SURGICAL OFFICER (B1), Male. Salary £250 p.a., with residence, board, and laundry. Preference given to one holding the F.R.C.S. Suitably qualified R practitioners holding B2 appointments, also those holding B1 and rejected by the R.A.M.C., may apply.

Applications, stating age, previous experience, and nationality, together with testimonials, should be sent immediately to—

30th July, 1945. A. MIDGLEY, Secretary.

SCARBOROUGH HOSPITAL, Yorkshire. (Normally 140 Beds.) Applications are invited from registered medical practitioners for the post of HOUSE SURGEON (A). The appointment is for 6 months, commencing 1st September, 1945, and the salary is at the rate of £175 p.a., with board, residence, laundry, &c. Practitioners within 3 months of qualification and liable under the National Service Acts may also apply.

Applications, with age, testimonials, qualifications, &c., to be sent immediately to the Secretary.

ST. ALBANS AND MID HERTS HOSPITAL, Church-crescent, ST. ALBANS, HERTS. (75 Beds.) Applications are invited from registered medical practitioners, Male or Female, for the appointment of RESIDENT MEDICAL OFFICER (B2), vacant in October. Salary at the rate of £200 p.a., with full residential emoluments. R practitioners holding A posts may apply, when the appointment will be limited to 6 months.

Applications, together with copies of testimonials, should be sent to: P. R. BATTISON, Secretary.

THE STAFFORDSHIRE GENERAL INFIRMARY, Stafford. Applications are invited from registered medical practitioners, Male and Female, for the appointment of HOUSE SURGEON (A). Salary £196 p.a., with board-residence. Practitioners within 3 months of qualification and liable under the National Service Acts may also apply, when appointment will be for 6 months.

Applications, with full particulars as to age and qualifications, accompanied by 3 recent testimonials, to be forwarded to—

Stafford, August, 1945. A. E. COLLINS, Secretary.

NOTTINGHAM GENERAL HOSPITAL. (712 Beds, including E.M.S. Beds.) Applications are invited from registered medical practitioners (Male and Female) for the appointment of RESIDENT CASUALTY OFFICER (A) for the above Hospital. Duties to commence immediately. Salary at the rate of £200 p.a., with full residential emoluments. Practitioners within 3 months of qualification and liable under the National Service Acts may apply, when the appointment will be for a period of 6 months.

Applications, stating age, qualifications, and experience, together with copies of testimonials, to be sent to—

HENRY M. STANLEY, House Governor and Secretary.

VICTORIA HOSPITAL, Accrington. Applications are invited from registered medical practitioners (Male or Female) for the following posts:—

HOUSE PHYSICIAN (A). Appointment will be for a period of 6 months. Salary at the rate of £175 p.a., with full residential emoluments. Practitioners within 3 months of qualification and liable under the National Service Acts may apply.

HOUSE SURGEON (B2). Appointment will be for a period of 6 months. Salary at the rate of £200 p.a., with full residential emoluments. R practitioners who now hold A posts may apply.

Applications, with copies of recent testimonials, to be sent to: P. D. WADSWORTH, Honorary Secretary.

HUDDERSFIELD ROYAL INFIRMARY. (321 Beds.) Casualty OFFICER (A) required to commence immediately. Salary at the rate of £200, with full residential emoluments. Practitioners within 3 months of qualification and liable under the National Service Acts may apply, when appointment will be limited to 6 months.

Applications should be sent as soon as possible to—

H. J. JOHNSON, General Superintendent and Secretary.

HUDDERSFIELD ROYAL INFIRMARY. (321 Beds.) Applications are invited for the post of RESIDENT SURGICAL OFFICER (B1). Applicants should have held house appointments and preference will be given to candidates holding diploma of F.R.C.S. Salary at the rate of £350 p.a., with full residential emoluments. Suitably qualified R practitioners holding B2 appointments, also those holding B1 and rejected by the R.A.M.C., may apply.

Applications should be addressed to—

H. J. JOHNSON, General Superintendent and Secretary.

YORK COUNTY HOSPITAL. (222 Beds.) Applications are invited from registered medical practitioners, Male and Female, for the following appointment:—

ORTHOPÆDIC HOUSE SURGEON AND CASUALTY OFFICER (B2), vacant 27th September, 1945.

The salary is at the rate of £175 p.a., with full residential emoluments. R practitioners who now hold A posts may apply, when the appointment will be limited to 6 months.

Applications to be sent immediately to—

J. R. MACKRILL, Secretary.

CAMBORNE-REDRUTH MINERS' AND GENERAL HOSPITAL, REDRUTH, CORNWALL. Applications are invited from registered medical practitioners, Male and Female, for the appointment of HOUSE SURGEON (A), vacant 19th October, 1945. Salary at the rate of £200 p.a., with the usual residential emoluments. Practitioners within 3 months of qualification and liable under the National Service Acts may apply, when appointment will be for a period of 6 months.

Applications, together with copies of 3 testimonials, to be addressed to: J. C. FIELD, Secretary-Superintendent.

Redruth, August, 1945.

CAMBORNE-REDRUTH MINERS' AND GENERAL HOSPITAL, REDRUTH. With the formation of a special department, a vacancy occurs for a PHYSICIAN for Diseases of Children. A higher qualification, preferably Membership of the Royal College of Physicians, is essential. Experience in pædiatrics would be an additional advantage. Candidates must be prepared to engage solely in consulting practice in this sphere.

Full particulars may be obtained from the undersigned. Applications from Service candidates are specially invited. It is not proposed to make an appointment before December, 1945, in order that serving practitioners may receive full consideration. J. C. FIELD, Secretary-Superintendent.

BRADFORD ROYAL INFIRMARY. Applications are invited from registered medical practitioners (Male, single) for the appointment of HOUSE SURGEON (B2), vacant 1st October, 1945. 6 months' appointment. Salary £150 p.a., with full residential emoluments. There are 372 Beds and 8 resident officers. R practitioners holding A posts may apply.

Applications, stating age, nationality, qualifications, and previous experience, with copies of 3 recent testimonials, should be sent immediately to— H. TRUSSON,

28th August, 1945. House Governor and Secretary.

THE ROYAL LIVERPOOL CHILDREN'S HOSPITAL, Myrtle-street, LIVERPOOL, 7. The Committee invite applications for the post of SURGICAL REGISTRAR (B1) for 12 months from 1st October, 1945. Salary is at the rate of £200 p.a. Suitably qualified R practitioners holding B2 appointments, also those holding B1 and rejected by the R.A.M.C., may apply.

Further particulars may be obtained from the Secretary of the Hospital, to whom applications should be sent, with copies of recent testimonials, by an early post.

LEEDS PUBLIC DISPENSARY AND HOSPITAL. Applications are invited from registered medical practitioners for the appointment of HOUSE PHYSICIAN (A), to include casualty duties. Appointment for 6 months. Salary at the rate of £150 p.a., with board, residence, and laundry. Practitioners within 3 months of qualification and liable under the National Service Acts may also apply.

Applications, stating age, qualifications, and nationality, and accompanied by copies of 3 recent testimonials, to be addressed to: CHARLES F. J. MAURY, Secretary and Superintendent.

THE LEICESTER ROYAL INFIRMARY. Honorary Assistant SURGEON. The Board invites applications for this position—arisen as the result of the death of the Senior Honorary Surgeon. Candidates must be Fellows or Members by examination of the Royal College of Surgeons of England or graduates in surgery of one of the universities of the United Kingdom or Ireland. Service candidates are eligible to apply for the appointment, which will be made on the 16th January, 1946, on which date candidates will be asked to interview the Board. 100 guineas annually is granted by the Board for out-of-pocket expenses. This matter is under revision.

Applications, with recent testimonials, to reach the undersigned by first post on Saturday, 1st December, 1945.

H. T. PLOWMAN, House Governor and Secretary.

23rd July, 1945.

ROYAL SOUTH HANTS AND SOUTHAMPTON HOSPITAL, SOUTHAMPTON. (255 Beds.) Applications are invited from registered medical practitioners, Male and Female, including practitioners within 3 months of qualification and liable under the National Service Acts, for the appointment of CASUALTY OFFICER AND HOUSE SURGEON (A) to the E.N.T. Department. The appointment will be for a period of 6 months. Salary is at the rate of £175 p.a., with full residential emoluments.

Applications, stating age, qualifications with dates, nationality, and present post, and accompanied by copies of 3 recent testimonials, should be sent immediately to—

FRANK JENNINGS, House Governor and Secretary.

SALISBURY GENERAL INFIRMARY. (Voluntary Hospital—225 Beds.) Applications are invited from registered medical practitioners for the appointment of HOUSE SURGEON (A). Salary at the rate of £150 p.a., with full residential emoluments. Practitioners within 3 months of qualification and liable under the National Service Acts may also apply, when appointment will be for a period of 6 months.

Applications, stating age, nationality, qualifications, and experience, together with copies of recent testimonials, should be sent to: JOHN WILLIAMS, Superintendent and Secretary.

THE PRINCE OF WALES'S HOSPITAL, Greenbank-road, PLYMOUTH. Applications are invited from registered medical practitioners for the appointment of CASUALTY OFFICER (A) for duty at Greenbank-road, vacant 6th October. Salary is at the rate of £175 p.a., with full residential emoluments. Practitioners within 3 months of qualification and liable under the National Service Acts may apply, when the appointment will be for a period of 6 months.

ARTHUR R. CASH, General Superintendent.

PAPWORTH VILLAGE SETTLEMENT, near Cambridge. Applications are invited from registered medical practitioners for the appointment of RESIDENT SURGICAL OFFICER (B1). Applicants should have held house appointments and had experience in tuberculosis and thoracic surgery. Preference will be given to candidates holding the diploma of F.R.C.S. The appointment is for 1 year in the first place. Salary £600 p.a., rising to £800 p.a. by £100, with board, lodging, and laundry. Suitably qualified R practitioners holding B2 appointments, also those holding B1 and rejected by the R.A.M.C., may apply.

Applications, with copies of 3 recent testimonials, should be sent to the Medical Director, Papworth Village Settlement, Papworth Hall, Cambridge.

WEST SUSSEX COUNTY MENTAL HOSPITAL, Graylingwell, CHICHESTER. Applications are invited from registered medical practitioners (Male or Female) for the appointment of TEMPORARY ASSISTANT MEDICAL OFFICER (B1). Previous experience in psychiatry is desirable. Salary according to qualifications and experience, but not less than £475 p.a., with full residential emoluments or cash in lieu. An additional £50 p.a. is payable for the possession of the D.P.M. This appointment is terminable by 1 month's notice. R practitioners now holding B2 posts, also those holding B1 and rejected by the R.A.M.C., may apply.

Applications, giving full particulars and copies of recent testimonials, should be sent as soon as possible to the Medical Superintendent.

HOVE GENERAL HOSPITAL. Applications are invited from registered medical practitioners, Male or Female, for the appointment of HOUSE SURGEON (B2). Salary at the rate of £200–£250 p.a., according to experience, with full residential emoluments. R practitioners who now hold A posts may apply, when appointment will be limited to six months; otherwise may be extended.

Applications should reach the undersigned as soon as possible, stating when free.

J. V. ROE, Secretary-Superintendent.

CLAYTON HOSPITAL, Wakefield. Applications are invited immediately from registered medical practitioners for the appointment of RESIDENT ORTHOPÆDIC OFFICER with Casualty duties (B2), Male. Salary £200 p.a., with full residential emoluments. R practitioners who now hold A posts may apply, when appointment will be limited to 6 months; otherwise may be extended for a further period.

Applications should be sent as soon as possible to—

W. READ, Superintendent and Secretary.

CITY OF NORWICH. Woodland Hospital. (311 Beds.) Applications are invited from registered medical practitioners for the appointment of ASSISTANT RESIDENT MEDICAL OFFICER (B2). The salary is at the rate of £250 p.a., with full residential emoluments. R practitioners who now hold A posts may apply, when the appointment will be limited to 6 months; otherwise a period of 1 year.

Further particulars of appointment to be obtained from the Senior Medical Officer, Woodland Hospital, Bowthorpe-road, Norwich, and to whom applications should be sent.

BERNARD D. STOREY, Town Clerk.

City Hall, Norwich, August, 1945.

BURTON-ON-TRENT GENERAL INFIRMARY. (200 Beds, Normal.) Applications are invited from registered medical practitioners for the appointment of CASUALTY OFFICER AND HOUSE SURGEON (A). Salary at the rate of £200, with the usual residential emoluments. Practitioners within 3 months of qualification and liable under the National Service Acts may apply, when the appointment will be for a period of 6 months.

Applications, stating qualifications, age, and nationality, and accompanied by copies of 3 testimonials, to be sent to the Secretary-Superintendent.

ALTRINCHAM GENERAL HOSPITAL, near Manchester. (100 Beds.) Applications are invited for the appointment of RESIDENT SURGICAL OFFICER (B1). The post offers considerable scope in operative surgery, and the holder must have had experience to enable him to undertake the work. Salary £250 p.a., with full residential emoluments. Suitably qualified R practitioners holding B2 appointments, those holding B1 and rejected by the R.A.M.C., and those discharged from the Forces may apply.

Applications to General Superintendent.

CITY OF CARLISLE. City General and Fusehill Emergency Hospitals, CARLISLE. (100 Civilian Beds, 200 E.M.S. and Reserve Beds.) Applications are invited for the appointment of RESIDENT MEDICAL OFFICER (B1), vacant now, for the care of civilian beds. The chief duties are in the Maternity and Gynæcological Wards, and the appointment offers excellent experience of abnormal midwifery. The person appointed will also have charge of some medical and surgical wards. Salary at the rate of £350 p.a., plus full residential emoluments. The appointment is for 6 months in the first instance. Suitably qualified R practitioners holding B2 appointments, also those holding B1 and rejected by the R.A.M.C., may apply.

Applications should be sent to the Acting Medical Officer of Health, 22, Fisher-street, Carlisle, as early as possible.

NEW SUSSEX HOSPITAL FOR WOMEN, Windlesham-road, BRIGHTON. Applications are invited from registered medical Women for the posts of HONORARY CLINICAL ASSISTANTS to the Out-patients' Department, as follows: Surgical, Tuesday evenings; Gynæcological, Thursday afternoons.

Applications and copies of 3 testimonials to be sent as soon as possible to: Mr. P. F. SPOONER, Secretary.

NEW SUSSEX HOSPITAL FOR WOMEN, Windlesham-road, BRIGHTON. Applications are invited from registered medical practitioners (Female) for the appointment of HOUSE SURGEON (B2), vacant in the middle of October. The appointment is for a period of 6 months. Salary at the rate of £150 p.a., with full residential emoluments.

Applications, stating age, qualifications with dates, and accompanied by copies of recent testimonials, should be sent to: PERCY F. SPOONER, Secretary.

SURREY COUNTY COUNCIL. St. Luke's Hospital, Guildford. (500–600 Beds.) Applications are invited from suitably qualified practitioners (Male or Female) for the appointment of Whole-time PATHOLOGIST to the St. Luke's Hospital, Guildford (which includes the large E.M.S. Radiotherapy Unit). Applicants should have had wide pathological experience and be of senior standing in the profession. The person appointed will be in charge of the work of the Pathological Laboratory at the Hospital, where there are at present 2 Technicians employed, and will be required to perform all autopsies. The appointment will be temporary and subject to 3 months' notice on either side, but any Local Government Superannuation rights will be preserved. The permanent appointment will be readvertised later in order to give doctors at present serving with H.M. Forces an opportunity to apply after their discharge. Commencing salary according to experience on the grade £1000–£50–£1500 p.a.

Apply to the County Medical Officer, County Hall, Kingston-upon-Thames, by the 15th October, 1945.

SURREY COUNTY COUNCIL. Epsom County Hospital, Dorking-road, EPSOM. (350 Beds.) Applications are invited from registered medical practitioners, Male and Female, for the appointment of ASSISTANT MEDICAL OFFICER (B2). Applicants must have held house appointment with general experience and should be capable of administering anæsthetics. Salary at the rate of £250 p.a., plus full residential emoluments and war bonus. R practitioners who now hold A posts may apply, when the appointment will be limited to 6 months; otherwise will not exceed 1 year.

Apply to the Medical Superintendent at the Hospital by 12th September, 1945.

DERBYSHIRE ROYAL INFIRMARY, Derby. (Voluntary Hospital—416 Beds, plus 115 E.M.S.) Applications are invited from registered medical practitioners, Male or Female, for the appointment of ACCIDENT AND CASUALTY OFFICER (A). Duties will be in the Casualty Department, Hand Clinic, and Accident Wards. The position is now vacant. Salary is at the rate of £200 p.a., with full residential emoluments. Practitioners within 3 months of qualification and liable under the National Service Acts may also apply, when the appointment will be for a period of 6 months.

Applications should be sent as soon as possible.

ARTHUR TAYLOR, Superintendent and Secretary.

ROYAL BERKSHIRE HOSPITAL, Reading. Applications are invited from registered medical practitioners, Male and Female, for the appointment of HOUSE PHYSICIAN (A), vacant 23rd October, 1945. Salary is at the rate of £150 p.a., with full residential emoluments. Practitioners within 3 months of qualification and liable under the National Service Acts may also apply, when the appointment will be for a period of 6 months.

Applications, stating age, qualifications with dates, nationality, and present post, and accompanied by copies of 3 recent testimonials, should be sent immediately to—

H. E. RYAN, Secretary and House Governor.

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STAFFORDSHIRE MENTAL HOSPITALS BOARD. County MENTAL HOSPITAL, BURNTWOOD, near LICHFIELD. The Staffordshire Mental Hospitals Board invite applications for the post of Permanent MEDICAL SUPERINTENDENT of the County Mental Hospital at Burntwood, near Lichfield, from duly registered Male medical practitioners who must hold the Diploma in Psychological Medicine. Applicants must be experienced in the treatment of all mental disorders and capable of controlling and administering a large mental hospital. The successful candidate must devote his whole time to the performance of his duties as Medical Superintendent, including attendance at Out-patient Clinics as may be required, and must not engage in any professional or other business or employment other than that of the Hospital, except with the approval of the Visiting Committee of the Hospital, and all fees received are to be paid over to the Board. He will be required to own a car, for which he will be paid an approved mileage allowance in respect of journeys necessarily performed in the carrying out of his duties. Salary £1400 p.a., rising by 4 annual increments of £50 to a maximum of £1600 p.a., together with emoluments valued at £100 p.a., consisting only of an unfurnished house, rent and rates free. The appointment will be subject to the provisions of the Asylums Officers' Superannuation Act, 1909, and to 3 months' notice on either side.

Applications, endorsed "Medical Superintendent, Burntwood Mental Hospital," giving particulars of age, qualifications, experience, &c., together with not more than 3 recent testimonials, must be received by me, the undersigned, not later than Friday, the 4th January, 1946. Candidates must state whether they are related to any member of the Mental Hospitals Board, and canvassing, directly or indirectly, will be a disqualification.

T. H. EVANS, Clerk to the Mental Hospitals Board.
County Buildings, Stafford, 11th August, 1945.

WALSALL GENERAL HOSPITAL. (181 Beds.) Applications are invited from registered medical practitioners, Male and Female, for the post of HOUSE PHYSICIAN (A) at a salary of £150 a year, with full residential emoluments. Practitioners within 3 months of qualification and liable under the National Service Acts may apply, when appointment will be for a period of 6 months.

Applications, stating age, qualifications with dates, and nationality, and accompanied by copies of 3 recent testimonials, should be forwarded immediately to—

W. H. HARPER, Honorary House Governor.

ROYAL CORNWALL INFIRMARY, Truro. (330 Beds—5 Residential.) Applications are invited from registered practitioners (Male or Female) for the following appointments:—

HOUSE SURGEON (B2) to the General Surgical and Gynæcological Departments, vacant on or about 25th October, 1945.

ORTHOPÆDIC AND CASUALTY HOUSE SURGEON (B2), vacant on or about 11th October, 1945.

Salary is at the rate of £200 p.a., with full residential emoluments for each post. R practitioners holding A posts may also apply, when appointments are limited to 6 months.

Applications should be addressed to the Secretary, 1st September, 1945.

LORD MAYOR TRELOAR CRIPPLES' HOSPITAL AND COLLEGE, ALTON and HAYLING ISLAND, HANTS. (400 Beds.) Applications are invited for the post of resident MEDICAL SUPERINTENDENT of the above Hospital. Candidates should be under the age of 45 and must have senior surgical qualifications and experience in orthopædic work. Salary £1500 to £2000, according to experience. House, lighting and fuel provided.

Applications, together with testimonials and full particulars of professional experience, should reach the Secretary on or before 31st December, 1945.

GRIMSBY AND DISTRICT GENERAL HOSPITAL. (237 Beds.), Applications are invited from registered medical practitioners, Male, for the post of RESIDENT SURGICAL OFFICER (B1), commencing 1st November. Salary at the rate of £300 p.a. Suitably qualified R practitioners holding B2 appointments, also those holding B1 and rejected by the R.A.M.C., may apply.

Applications, stating age, nationality, qualifications, and copies of 3 recent testimonials, to the Secretary-Superintendent.

HULL ROYAL INFIRMARY. Applications are invited from registered medical practitioners for the appointment of RESIDENT SURGICAL OFFICER (B1), vacant September. Preference will be given to candidates holding diploma of F.R.C.S. The holder of the post will be required also to undertake temporarily the duties of Senior House Surgeon. Salary £250 p.a., with full residential emoluments. Suitably qualified R practitioners holding B2 appointments, also those holding B1 and rejected by the R.A.M.C., may apply.

Applications to: R. J. CARLESS, House Governor.

AUCKLAND HOSPITAL BOARD, New Zealand. Applications addressed to the undersigned and closing at NOON on Monday, 15th October, 1945, are invited from registered medical practitioners for 2 appointments as SENIOR RADIOLOGISTS at the Board's Institutions, at commencing salaries of £1000 p.a., rising by 2 annual increments of £100 to £1200 p.a. (living out), New Zealand currency. Applicants must hold a Diploma in Radiology. The appointments are whole-time and are for Diagnostic Radiology only. The Board's Institutions include: (1) The Auckland Hospital of 1000 Beds (with a Director of Radiology and an Assistant Radiologist already appointed). (2) The Green Lane Hospital of 600 Beds, including a Chest Diseases Department. (3) The Middlemore Hospital of 300 Beds, including an Orthopædic Department. New X-ray Departments are being opened in the two latter hospitals this year. Conditions and memorandum of appointment may be obtained from the office of the High Commissioner for New Zealand, New Zealand House, The Strand, London.

Applications should be endorsed "Senior Radiologist," and sent to New Zealand direct by air mail.

R. F. GALBRAITH, Secretary.

ROYAL MANCHESTER CHILDREN'S HOSPITAL, Pendlebury. Applications are invited for the post of RESIDENT SURGICAL OFFICER (B1). Salary £175 p.a. The appointment is for a period of 6 months, commencing 14th September. Suitably qualified R practitioners holding B2 posts, also those holding B1 and rejected by the R.A.M.C., may apply.

Applications, stating age and accompanied by copies of not more than 3 recent testimonials, to be sent to the undersigned immediately. By Order,

H. HEARDMAN, General Superintendent and Secretary.

For Sale, handsome Binocular Microscope Stand, in mahogany case, extra accessories—Crouch, London. Two partly filled Slide Cabinets. Seen by appointment. 50 guineas.—GRIFFITHS, Hilston, Lache-lane, Chester.

Practice wanted by demobilised Doctor, preferably Home Counties.—Address, No. 703, THE LANCET Office, 7, Adam-street, Adelphi, London, W.C.2.

Secretary (good Shorthand-Typist) requires residential Post. Would assist in home if only part-time secretarial work available.—MILLER, Tarnmoor, Hindhead, Surrey.

Accountant free to attend to professional gentlemen's books and accounts in evenings or week-ends to mutual convenience. Terms according to work entailed. London or environs.—Address, No. 704, THE LANCET Office, 7, Adam-street, Adelphi, London, W.C.2.

Medical Practice.—For Sale, old-established Private and Panel Practice, situate 20 miles from Belfast.—For further particulars apply, in confidence (by letter only), to: JAMES BAIRD & CO., Incorporated Accountants, 72, High-street, Belfast.

Anglo-Brazil Trade.—Technologist with good business connexions, returning presently to Brazil, offers his services to British firm who wish to export to or import from Brazil.—Reply: Address, No. 702, THE LANCET Office, 7, Adam-street, Adelphi, London, W.C.2.

Receptionists, linguists and non-linguists, part and full-time workers. All members ex-censorship personnel, fully qualified and competent to undertake work of confidential nature.—Apply to the Secretary, THE POST-WAR EMPLOYMENT ASSOCIATION (licensed annually by the L.C.C.), 27, Lincoln's Inn-fields, W.C.2. Tel.: HOLborn 5522 (Ext. 3).

Ex-Waaf, age 35, 4 years' experience Medical Service, seeks position as Nurse-Receptionist-Radiographer. London area. Accustomed to administration. Free to commence November–December.—Address, No. 698, THE LANCET Office, 7, Adam-street, Adelphi, London, W.C.2.

Assistantship, part-time, November-January inclusive, in or near London by G.P., aged 39, working for diploma.—Address, No. 697, THE LANCET Office, 7, Adam-street, Adelphi, London, W.C.2.

Secretary requires position with Doctor as Receptionist-Secretary. London area.—Address, No. 699, THE LANCET Office, 7, Adam-street, Adelphi, London, W.C.2.

Shorthand-Typist requires position as Receptionist with Doctor. 3 days weekly. London area.—Address, No. 700, THE LANCET Office, 7, Adam-street, Adelphi, London, W.C.2.

V.A.D. Dispenser, demobilised early September, desires post as Secretary-Receptionist to Doctor, London or Kent or Sussex Coast preferred. Previous experience.—Address, No. 701, THE LANCET Office, 7, Adam-street, Adelphi, London, W.C.2.

Bacteriologist.—A medically qualified Gentleman is required in Birmingham on an approximate half-time basis in a Department of Bacteriology already established.—Address, No. 696, THE LANCET Office, 7, Adam-street, Adelphi, London, W.C.2.

Experienced Secretary-Receptionist available for post with West End Surgeon or Specialist.—Address, No. 687, THE LANCET Office, 7, Adam-street, Adelphi, London, W.C.2.

Partnership for Sale, South Coast town. Excellent prospects. One-third Share. Gross income over £6000. Panel over 2000. 2 years' purchase.—Address, No. 683, THE LANCET Office, 7, Adam-street, Adelphi, London, W.C.2.

For Sale, large Country House with Lodge and considerable grounds, main water and electricity. Close proximity London. Perfect surroundings. Would make ideal Nursing Home. Would consider suitable rental.—Address, No. 686, THE LANCET Office, 7, Adam-street, Adelphi, London, W.C.2.

Electrotherapy, Massage, &c. (Manchester). Owner retiring, opportunity for young Practitioner. Price, including Equipment, House (with garage), £2500. Mortgage arranged. Also Nursing Homes for Sale from £1500.—Write: NATIONAL ASSOCIATION OF NURSING HOMES (Sales Section), 15, Castle-street, Exeter.

To be Sold. Llannerch Park, St. Asaph. A well-known Mansion House situated amidst beautiful scenery in the Vale of Clwyd, North Wales. Most suitable for a School, Medical Institution, high-class Hotel or Service Flats. Ample accommodation. 100 acres of park available, if required, for golf links. Fishing over 1 mile of the River Clwyd. Excellent walled garden, own swimming pool, tennis lawns, &c. Central heating, main water and electricity. 8 miles from well-known seaside resort. Excellent bus service. Station 1 mile. Order to view by permit only.—Apply: R. E. BIRCH, Estate Office, Coed Bedw, Abergele.

Doctors, Male and Female, required for Locums and Assistantships. Vacancies for Hospital Locums and Ships' Surgeons. Practices and Partnerships for disposal.—Write: A. SHAW, Medical Transfer Agent, Premier Buildings, 88, Church-street, Liverpool.

Medical Photographs and Drawings for illustrations, records, &c. —Write for particulars: E. O. SONNTAG, 159, Bickenhall Mansions, Baker-street, W.1. WELbeck 8860.

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Literature will be sent on request to members of the Medical Profession.

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